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# The Current Status of the Electric Utility Industry in the Ohio River Basin Energy Study States

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# THE CURRENT STATUS OF THE ELECTRIC UTILITY INDUSTRY IN THE OHIO RIVER BASIN ENERGY STUDY STATES

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This report was prepared as part of the Ohio River Basin Energy Study (ORBES), a multidisciplinary policy research program supported by the Environmental Protection Agency. It reviews the status of the electric utility industry in the six ORBES states: Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia. Topics include the investor-owned utilities, publicly-owned utilities and power agencies, rural electric cooperatives, electrical generation systems, electrical generating capacity, comparative financial and operating statistics for investor-owned utilities, and regulation in the electric utility industry.

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# FOREWORD

The Ohio River Basin Energy Study (ORBES) is an interdisciplinary, multi-university inquiry into the environmental, economic, and social impacts of energy facility development in a major portion of the Ohio River Basin. The study was initiated by the U.S. Environmental Protection Agency in 1976 in response to a directive from the U.S. Senate Appropriations Committee.

Most of the ORBES research was conducted by a group of faculty members at the University of Illinois, Indiana University, the University of Kentucky, the University of Louisville, The Ohio State University, the University of Pittsburgh, Purdue University, and West Virginia University. In a few instances, the necessary expertise was found at other universities or independent research organizations.

This report is one of a series produced in support of the overall ORBES assessment. For a summary of the entire study, see Ohio River Basin Energy Study (ORBES): Main Report, by the ORBES Core Team, also being published by the U.S. Environmental Protection Agency.

# PREFACE

Many authors contributed time and expertise to this report: J.P. Hartnett and Jan L. Saper, Energy Resources Center, University of Illinois at Chicago Circle were responsible for those sections of Chapters II-IV dealing with the organizational framework of the industry and Chapter VII, "Comparative Financial and Operating Statistics for Investor-Owned Utilities."

Gary L. Fowler, Department of Geography and Steven D. Jansen, Energy Resources Center, University of Illinois at Chicago Circle wrote Chapter V, "Electrical Generating Systems" and Chapter VI "Electrical Generating Capacity: 1976-1985."

Boyd R. Keenan and Rita Harmata, Department of Political Science, University of Illinois at Chicago Circle wrote those sections of Chapters II-IV defining the institutional arrangements for each component of the industry.

Tom Sweet and Vince Cardi, College of Law, West Virginia University wrote Chapter VIII, "Regulation in the Electric Utility Industry."

The preliminary organizational work of Kathleen M. Brennan, formerly with the Energy Resources Center, and the secretarial support of the Energy Resources Center staff, especially the efforts of Claudette Eldridge and Marion B. Deloney, are also appreciated.

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# CHAPTER I

## INTRODUCTION

In the United States today, electricity is considered a necessity, relied upon by all sectors of our society. Except in those cases where an industry generates its own power, the production and distribution of electricity is the responsibility of the electric utility industry. By definition, the industry includes all enterprises involved in the production and/or distribution of electric power for use by the public. It is mandated, both by customer demands and by governmental regulation, to provide sufficient power with the greatest possible economy to meet all present and future demands for electric power while at the same time showing proper concern for the conservation of natural resources. This mandate is complicated by the fact that electricity, for the most part, cannot be stored and yet power must be available to the public at all times. Thus, to maintain adequate supplies of power, the industry must continually plan ahead, anticipating electrical requirements many years in advance of the actual need and ensuring that the necessary equipment is in place. As a result, consideration of the electric utility industry is an essential part of the Ohio River Basin Energy Study (ORBES).

ORBES was organized by the U.S. Environmental Protection Agency to "...identify and evaluate the potential consequences of levels, rates, and patterns of future energy development..."[1] In particular, the study was in part directed to focus on "...considerations of the environmental, public health, economic, institutional, and social impacts associated with possible future extension or modification of energy conversion facilities..."[2]

---

[1] Ohio River Basin Energy Study, "Phase II Work Plan" 2 August 1978, p. 1-3.

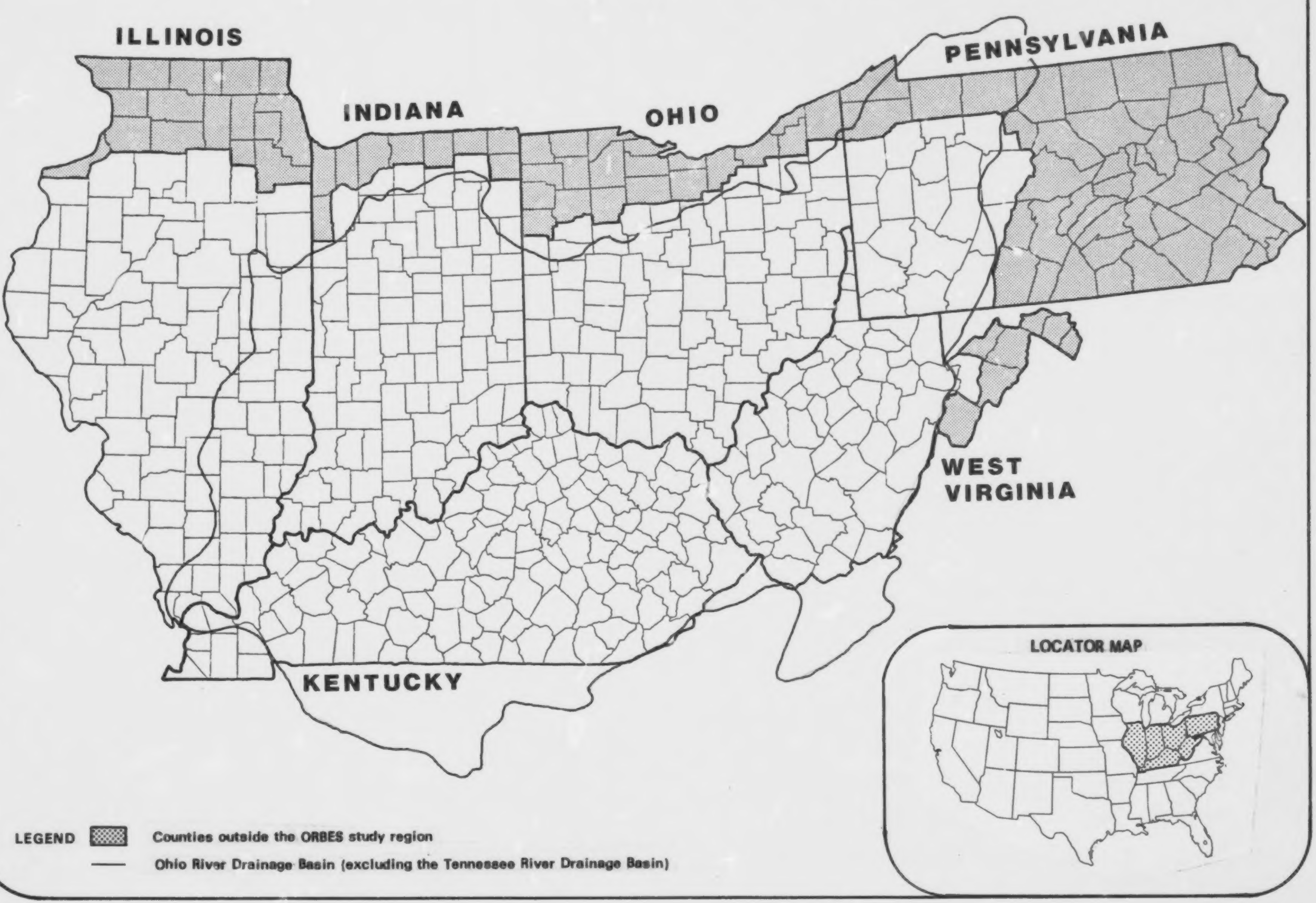
[2] Ibid.

The electric utility industry is essentially a vast conversion and distribution operation, converting primary fuels such as coal, uranium, oil and natural gas into electricity through an interlocking network of generating plants, distribution facilities, and transmission lines. Because of its importance to ORBES, it is necessary to understand how the industry operates. This report is intended to provide the "baseline data" needed to place the various facets of the industry in perspective and to offer a starting point for further evaluation. Thus, the report covers the institutional, technological, financial, and regulatory considerations within which the industry must operate.

In general, the ORBES study region includes those portions of Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia shown in Figure 1. This region contains the bulk of the Ohio River drainage area (excluding the portion located in Tennessee, Virginia, New York and Maryland) as well as those coal producing counties in Illinois outside the drainage area. Thus, the ORBES region includes a large portion of the Appalachian Basin Coal Fields and all of the coal in the Illinois Basin. However, for the purpose of this report, the entire six-state area is considered. This approach takes into account the nature of the electric utility industry. Utility service areas and generating facilities do not coincide with the ORBES region boundaries. Furthermore, many institutional and legal relationships may be described only in the context of the state and federal laws.

There is no single "baseline" year. Rather, data are gathered for a base period in the mid-1970's. It was done here, as in all ORBES research, because there is no single year in which complete information is available for all data categories. This is particularly true of the institutional and regulatory data where rules and interpretations are constantly altered.

Fig. 1 The ORBES States


ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
WEST VIRGINIA
KENTUCKY
LOCATOR MAP
LEGEND
▨ Counties outside the ORBES study region
— Ohio River Drainage Basin (excluding the Tennessee River Drainage Basin)

# CHAPTER II

# INVESTOR-OWNED UTILITIES

## Organizational Framework

### Utilities in the ORBES States

The investor-owned utilities in the ORBES states produce approximately 90 percent of the electric power, both for direct consumer use and for sales to all classes of electric utilities. Such a utility is a tax-paying business, usually financed by the sale of securities in the free market, whose properties are managed by representatives regularly elected by their shareholders. Investor-owned electric utilities, which may be owned by an individual proprietor or small group of people, are usually corporations open to ownership by the general public. There are a number of investor-owned utilities in the ORBES states (Table 1, A detailed description of each utility appears in Appendix B). Thirty-four large generating and transmission companies produce most of the power generated by investor-owned utilities. Of these, 26 operate completely within the six-state region and four more (Indiana-Michigan Electric Company, Monogahela Power Company, Potomac Edison Company, and Appalachian Power Company) operate largely within these states. The remaining companies (Union Electric Company, Interstate Power Company, Iowa-Illinois Power Company and Virginia Electric Company) have only small amounts of service territory in the ORBES states; the bulk of their areas are in adjacent states.

The small investor-owned utilities tend to fall into one of three categories: generating and transmission companies serving a limited number of customers; subsidiary companies set up to operate a generating station for the parent company,

TABLE 1

INVESTOR-OWNED UTILITIES IN THE ORBES STATES

| | Large Utilities | Small Utilities |
|---|---|---|
| Illinois | Central Illinois Light Co.<br>Central Illinois Public Service Co.<br>Commonwealth Edison Co.<br>Illinois Power Co.<br>Interstate Power Co.<br>Iowa-Illinois Gas and Electric Co.<br>Union Electric Co. | Electric Energy Inc.<br>Sherrard Power System<br>South Beloit Water, Gas |
| Indiana | Indiana-Michigan Electric Co.<br>Indianapolis Power and Light Co.<br>Northern Indiana Public Service Co.<br>Public Service Company of Indiana<br>Southern Indiana Gas and Electric | Commonwealth Edison of Indiana<br>Indiana-Kentucky Electric Corporation |
| Kentucky | Kentucky Power Co.<br>Kentucky Utilities Co.<br>Louisville Gas and Electric Co. | Union Light, Heat and Power Company |
| Ohio | Cincinnati Gas and Electric Co.<br>Cleveland Electric Illuminating Co.<br>Columbus and Southern Ohio Electric Co.<br>Dayton Power and Light Co.<br>Ohio Edison Co.<br>Ohio Power Co.<br>Toledo Edison Co. | Cardinal Operating Co.<br>Miami Power Corporation<br>Ohio Electric Co.<br>Ohio Valley Electric Corp. |
| Pennsylvania | Duquesne Light Co.<br>Metropolitan Edison Co.<br>Pennsylvania Electric Co.<br>Pennsylvania Power Co.<br>Pennsylvania Power and Light Co.<br>Philadelphia Electric Co.<br>United Gas Improvement Corp.<br>West Penn Power Co. | Conowingo Power Co.<br>Hershey Electric Co.<br>Philadelphia Electric Power Co.<br>Safe Harbor Water Power Corp.<br>Susquehanna Electric Co. |
| West Virginia | Appalachian Power Co.<br>Monongahela Power Co.<br>Potomac Edison Co.<br>Virginia Electric Power Co. | Beech Bottom Power Co.<br>Central Operating Station<br>Kanawha Valley Power Co.<br>Wheeling Electric Co. |

or non-generating utilities which distribute power purchased from neighboring companies.

Eight utilities in the ORBES states are incorporated to operate individual plants for the parent company.[1] These include: Commonwealth Edison of Indiana, the Cardinal Operating Company and the Ohio Electric Company in Ohio, the Conowingo Power Company and the Philadelphia Electric Power Company in Pennsylvania and the Beech Bottom Power Company, Central Operating Station, and the Kanawha Valley Power Company, all in West Virginia.

Non-generating utilities purchase power from a neighboring power generating utility and distribute it to their own customers. There are five such utilities in the six-state area - Miami Power Corporation, Hershey Electric Company, Sherrard Power System, Union Light, Heat and Power Company and Wheeling Electric Company. Figure 2[2] shows the location of the service territories for many of these utilities in the ORBES states.

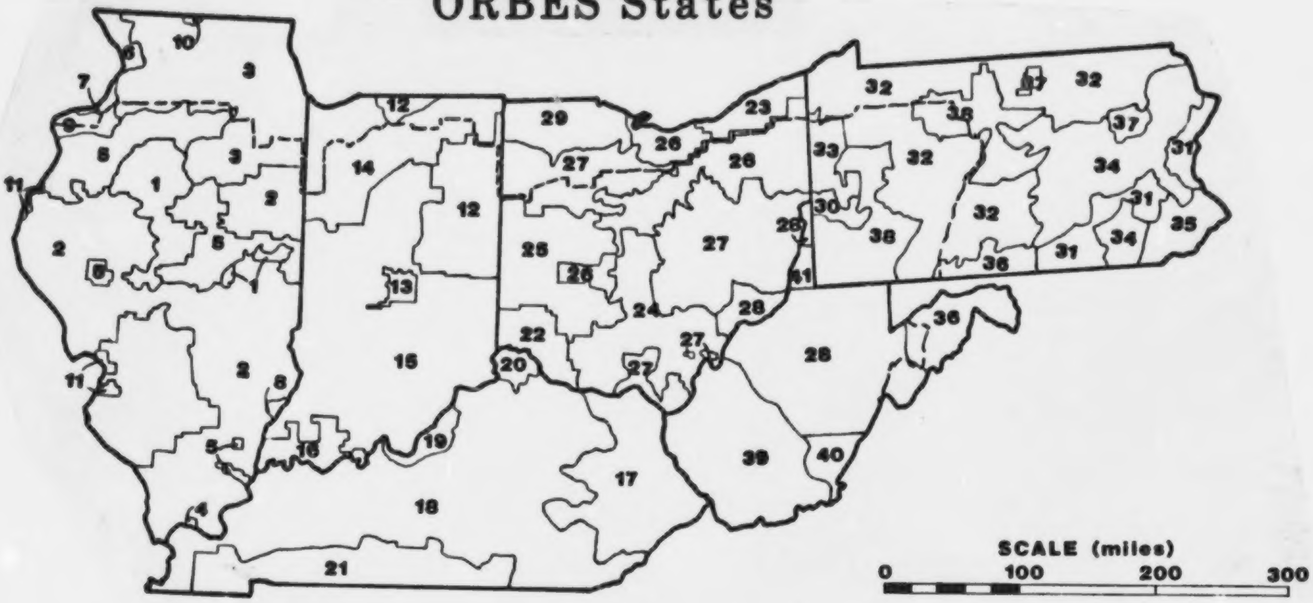
Another type of investor-owned utility is the holding company. By definition, a holding company is a corporation that directly or indirectly owns a majority or all of the voting securities of one or more utility companies which

---

[1] This is frequently done because many states do not permit a foreign utility (one which is only chartered to operate in another state) to operate within their boundaries.

[2] Figure 2 is a composite drawn from the following map sources:
Electric Light & Power, Investor-Owned Electric Utility Service Areas, Technical Publishing Company, Barrington, Illinois, February, 1977.
Illinois Commerce Commission, Electric Utilities In Illinois, Springfield, January, 1975.
Ohio Electric Utility Institute, Service Areas of Ohio Electric Utility Institute Members, Revised 1967.
General Public Utilities Corp., General Public Utilities Corporation System Map, Hagerstrom Co., New York, June, 1976.

Fig. 2 Utility Service Areas in the ORBES States



LEGEND

——— STATE BOUNDARIES

– – – ORBES PHASE II BOUNDARY

——— UTILITY SERVICE AREA

UTILITY CODES

IL 1 Central Illinois Light
2 Central Illinois Public Service Co.
3 Commonwealth Edison
4 Electric Energy Inc.
5 Illinois Power Co.
6 Interstate Power Co.
7 Iowa-Illinois Gas & Electric Co.
8 Mt. Carmel Public Utility Co.
9 Sherrard Power System
10 South Beloit Water, Gas & Electric Co.
11 Union Electric Co.

IN 12 Indiana-Michigan Electric Co.
13 Indianapolis Power & Light Co.
14 Northern Indiana Public Service Co.
15 Public Service Company of Indiana, Inc.
16 Southern Indiana Gas & Electric Co.

KY 17 Kentucky Power Co.
18 Kentucky Utilities
19 Louisville Gas & Electric Co.
20 Union Light, Heat, & Power Co.
21 Tennessee Valley Auth.

OH 22 Cincinnati Gas & Electric Co.
23 Cleveland Electric Illuminating Co.
24 Columbus & Southern Ohio Electric Co.
25 Dayton Power & Light
26 Ohio Edison Co.
27 Ohio Power Co.
28 Monongahela Power Co.
29 Toledo Edison Co.

PA 30 Duquesne Light Co.
31 Metropolitan Edison Co.
32 Pennsylvania Electric Co.
33 Pennsylvania Power Co.
34 Pennsylvania Power & Light Co.
35 Philadelphia Electric Co.
36 Potomac Edison Co.
37 United Gas Improvement Co.
38 West Penn Power Co.

WV 39 Appalachian Power Co.
28 Monongahela Power Co.
36 Potomac Edison Co.
40 Virginia Electric Power Co.
41 Wheeling Electric Co.

SOURCE: See previous page

are located in the same or contiguous states. Three holding companies control utilities in the ORBES states:

American Electric Power System (AEPS)
Allegheny Power Systems (APSI)
General Public Utilities (GPU)

AEPS brings eight companies, including two not in the ORBES states, into a single system (Figure 3). In addition, the company indirectly controls eight additional utilities. APSI and GPU each directly control three companies (Figures 4 and 5), while APSI controls two more companies indirectly.

## Power Consortia and Other Cooperative Ventures

A number of electric power consortia and other cooperative ventures operate in the ORBES states. One of the most structured is the Ohio Valley Electric Corporation (OHVC), which was created in the mid-1950's under the leadership of AEPS (Figure 6). Its purpose was to allow fifteen investor-owned utilities in the Ohio Valley area to jointly produce electric power for the U.S. Atomic Energy Commission (now Department of Energy) uranium enrichment plant near Portsmouth, Ohio. Today, OHVC and its subsidiary, the Indiana-Kentucky Electric Corporation, operate two generating stations primarily to serve the enrichment plant.

A similar arrangement provides power to DOE's enrichment plant in Paducah, Kentucky. Approximately half of the necessary power is supplied by Electric Energy Inc.'s Joppa Plant. The company is owned by four utilities - Illinois Power (20%), Central Illinois Public Service Company (20%), Kentucky Utilities (20%) and Union Electric Company (40%). The Tennessee Valley Authority supplies the remaining power to the enrichment plant.

Fig. 3 AMERICAN ELECTRIC POWER SYSTEM (AEPS)

ELECTRIC POWER COMPANIES DIRECTLY OR INDIRECTLY CONTROLLED

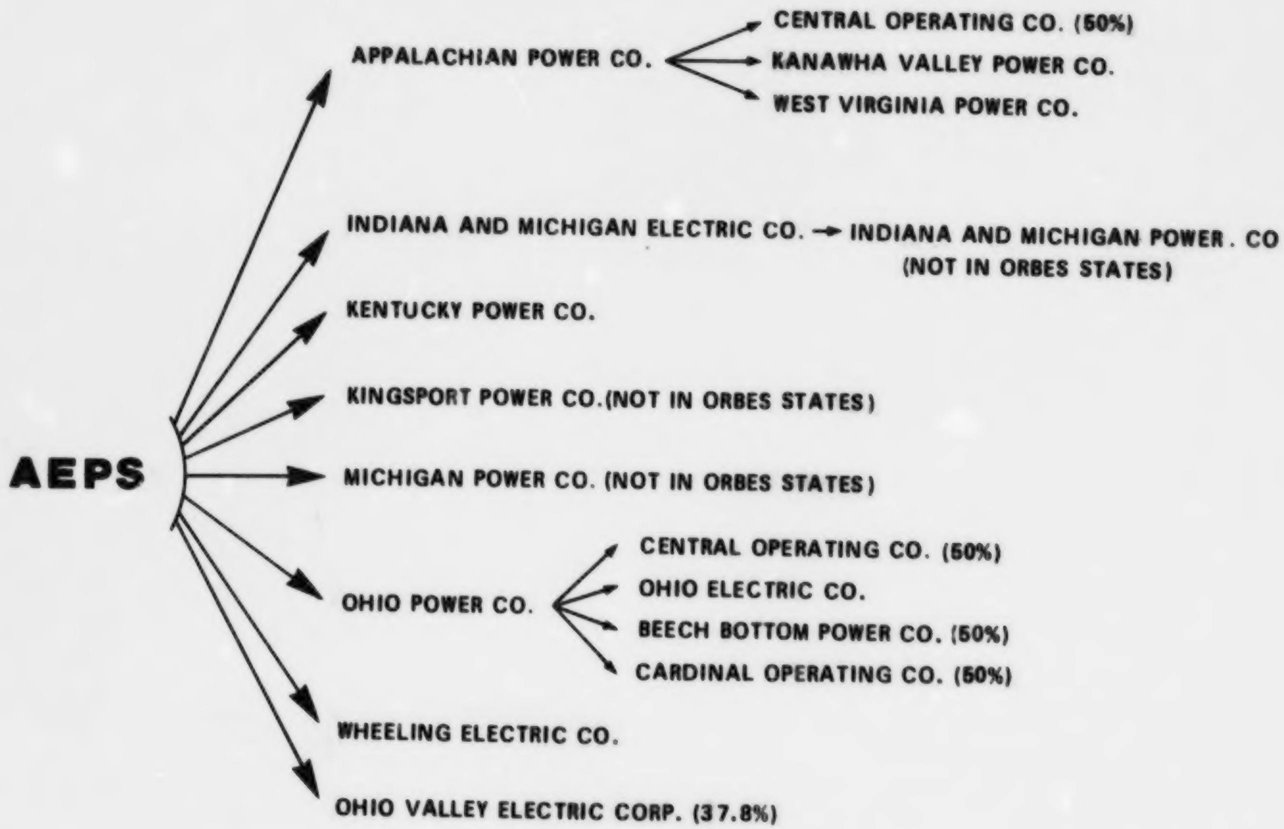

AEPS
APPALACHIAN POWER CO.
CENTRAL OPERATING CO. (50%)
KANAWHA VALLEY POWER CO.
WEST VIRGINIA POWER CO.
INDIANA AND MICHIGAN ELECTRIC CO.
INDIANA AND MICHIGAN POWER . CO
(NOT IN ORBES STATES)
KENTUCKY POWER CO.
KINGSPORT POWER CO.(NOT IN ORBES STATES)
MICHIGAN POWER CO. (NOT IN ORBES STATES)
OHIO POWER CO.
CENTRAL OPERATING CO. (50%)
OHIO ELECTRIC CO.
BEECH BOTTOM POWER CO. (50%)
CARDINAL OPERATING CO. (50%)
WHEELING ELECTRIC CO.
OHIO VALLEY ELECTRIC CORP. (37.8%)

Fig. 4 ALLEGHENY POWER SYSTEMS INC. (APSI)
ELECTRIC POWER COMPANIES CONTROLLED DIRECTLY OR INDIRECTLY

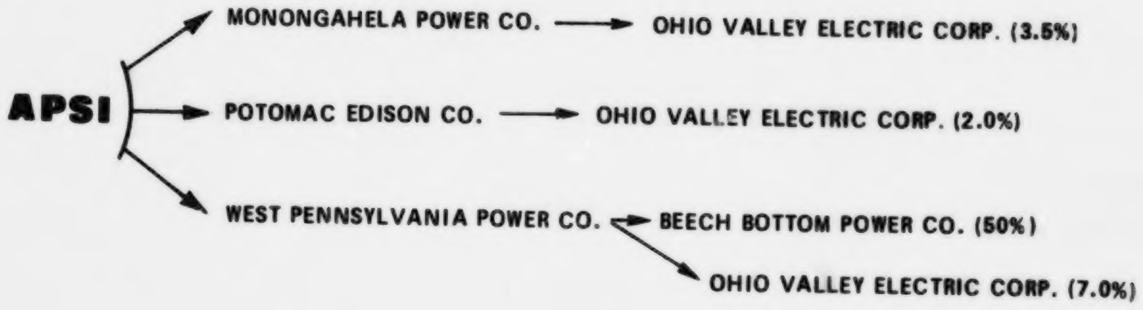

APSI
MONONGAHELA POWER CO.
OHIO VALLEY ELECTRIC CORP. (3.5%)
POTOMAC EDISON CO.
OHIO VALLEY ELECTRIC CORP. (2.0%)
WEST PENNSYLVANIA POWER CO.
BEECH BOTTOM POWER CO. (50%)
OHIO VALLEY ELECTRIC CORP. (7.0%)

Fig. 5 GENERAL PUBLIC UTILITIES CORPORATION (GPU)

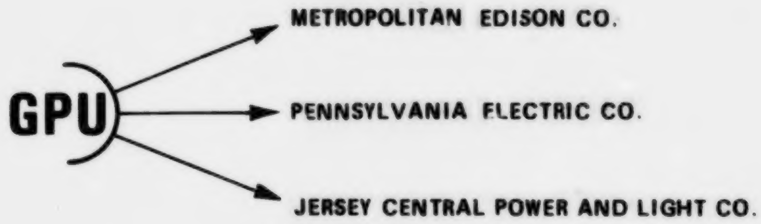
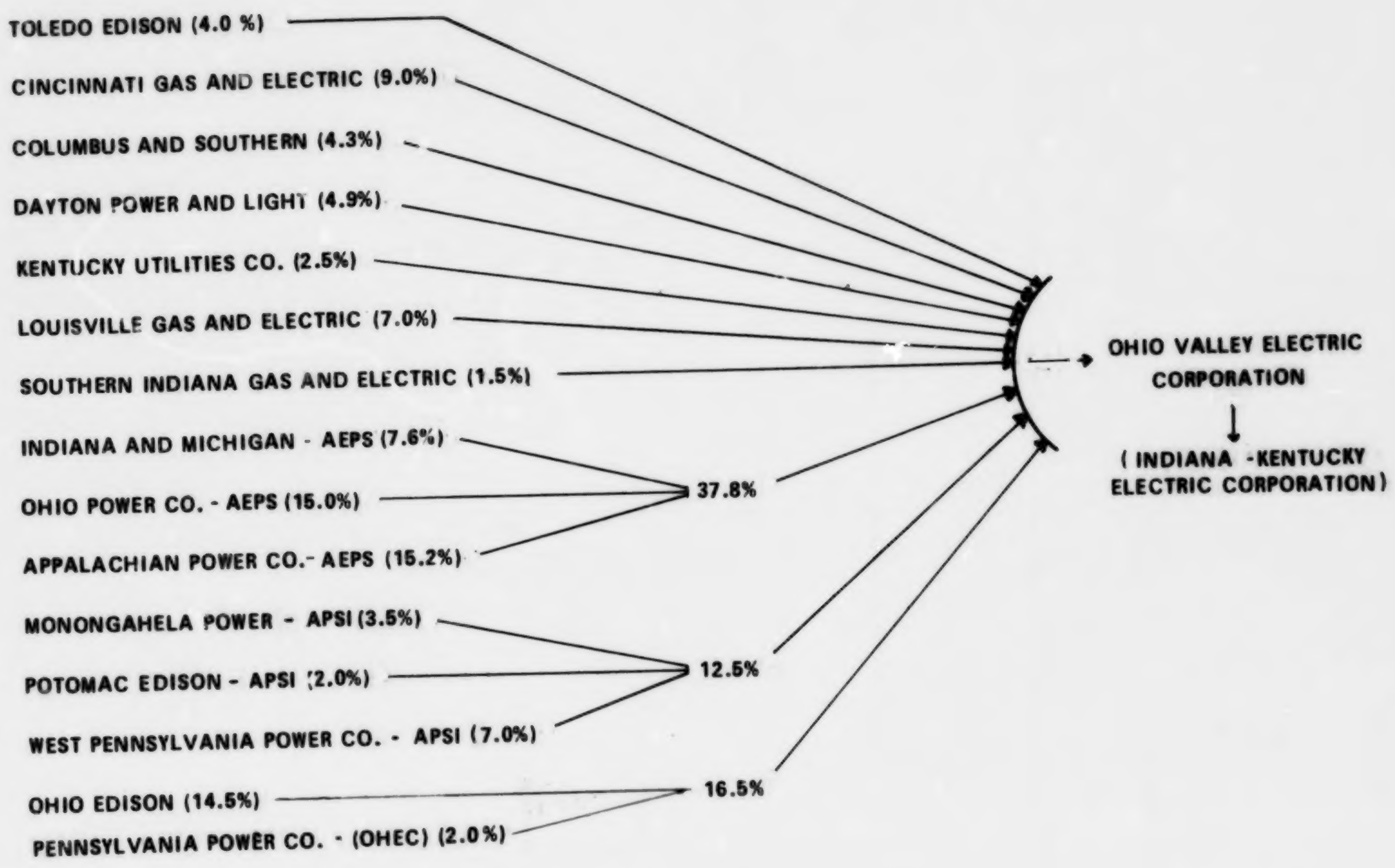

GPU
METROPOLITAN EDISON CO.
PENNSYLVANIA ELECTRIC CO.
JERSEY CENTRAL POWER AND LIGHT CO.

Fig. 6 OWNERSHIP OF
OHIO VALLEY ELECTRIC CORPORATION


TOLEDO EDISON (4.0 %)
CINCINNATI GAS AND ELECTRIC (9.0%)
COLUMBUS AND SOUTHERN (4.3%)
DAYTON POWER AND LIGHT (4.9%)
KENTUCKY UTILITIES CO. (2.5%)
LOUISVILLE GAS AND ELECTRIC (7.0%)
SOUTHERN INDIANA GAS AND ELECTRIC (1.5%)
INDIANA AND MICHIGAN - AEPS (7.6%)
OHIO POWER CO. - AEPS (15.0%)
APPALACHIAN POWER CO.- AEPS (15.2%)
37.8%
MONONGAHELA POWER - APSI (3.5%)
POTOMAC EDISON - APSI (2.0%)
WEST PENNSYLVANIA POWER CO. - APSI (7.0%)
12.5%
OHIO EDISON (14.5%)
PENNSYLVANIA POWER CO. - (OHEC) (2.0%)
16.5%
OHIO VALLEY ELECTRIC CORPORATION
( INDIANA -KENTUCKY ELECTRIC CORPORATION)

Power sharing occurs frequently among utilities in the ORBES states. The most common arrangement is the "power pool." A power pool consist of two or more utilities which are interconnected on a formal contractual basis to plan and operate their combined power supply in the most reliable and economical manner for their combined load and maintenance requirements. There are three pools in the ORBES states (Table 2).

Power sharing also extends down to the level of individual generating plants. Many plants, particularly the new larger ones are jointly owned, thus easing the financial burden for all owners and providing smaller utilities with an economical source of new generating capacity.[3]

## Reliability Councils

The National Electric Reliability Council (NERC) was formed voluntarily by the electric utility industry in 1968 following blackouts in the Northeast in 1965 and 1967; it was incorporated in 1975. NERC directs the efforts to augment the reliability and adequacy of bulk power supply of the electric utility systems in North America. NERC consists of nine regional councils whose memberships comprise essentially all of the electric utility systems in the United States and the Canadian systems in the provinces of Ontario, British Columbia, Manitoba, and New Brunswick.

The governing board of NERC is a Board of Trustees which consists of two representatives of each regional council, plus such additional members as necessary to assure at least two representatives of each segment of the electric utility industry: investor-owned, federal, rural electric cooperative and

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[3] Such plants are identified in: Steven D. Jansen, Electrical Generating Unit Inventory 1976-1986, prepared for the Ohio River Basin Energy Study, November, 1978.

## TABLE 2

## POWER POOLS WITH MEMBER SYSTEMS OPERATING IN THE ORBES STATES
(As of April 1, 1979)

Central Area Power Coordinating Group (CAPCO)
- Cleveland Electric Illumination Co.
- Duquesne Light Co.
- Ohio Edison Co.
- Pennsylvania Power Co.
- Toledo Edison Co.

PJM Interconnection (PJM)
- General Public Utilities
  - Metropolitan Edison Co.
  - Pennsylvania Electric Co.
- Pennsylvania Power and Light Co.
- Philadelphia Electric Co.
- United Gas Improvement Corporation

Illinois-Missouri Pool (IMP)
- Central Illinois Public Service Co.
- Illinois Power Co.
- Union Electric Co.

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SOURCES: East Central Area Reliability Coordination Agreement. Regional Reliability Council Coordinated Bulk Power Supply Program, Volume II. April 1, 1979 p. 1-ii.

Mid-Atlantic Area Council. Regional Reliability Council Coordinated Bulk Power Supply Program. April 1, 1979.

Mid-America Interpool Network. Regional Reliability Council Coordinated Bulk Power Supply Program. April 1, 1979 p. 1.

municipal/state.

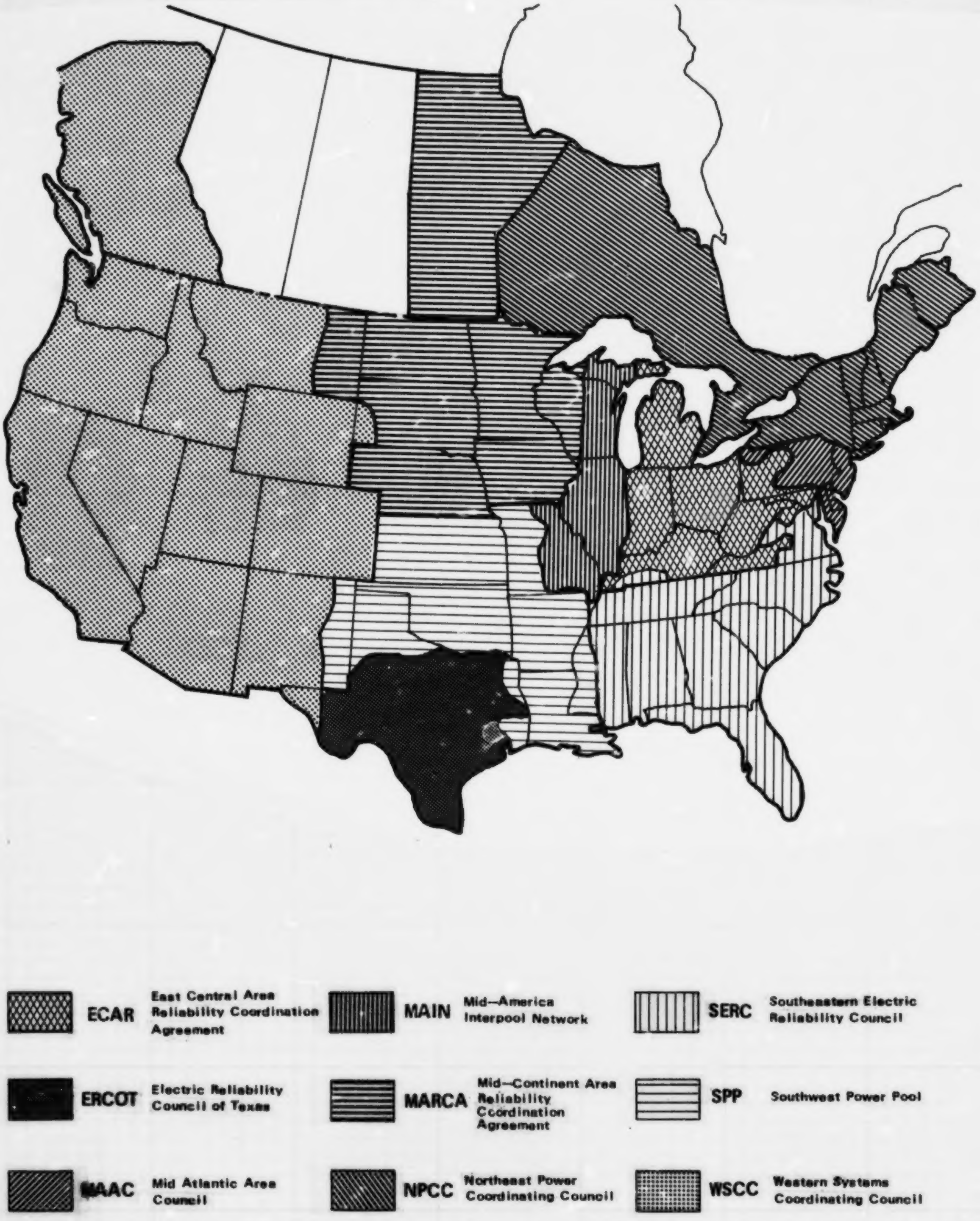
As one of its major activities, NERC makes an annual appraisal of the bulk power supply in North America for the upcoming ten years and issues an annual report detailing national and regional plans. In addition, NERC conducts special studies on factors affecting the electric power supply.

The regional reliability council is basically an administrative body representing a group of utilities from a specific region. Member utilities work together to ensure a higher degree of reliability than any one utility could provide alone. Not all utilities are members of a reliability council although all major companies are represented in one of the nine regional councils. The reliability councils differ from power pools in two important ways. Councils are essentially voluntary organizations governed by informal agreements. Furthermore, the councils do not own nor operate generation or transmission facilities as do power pools. Instead, they coordinate the needs and plans of their members in order to provide an overall plan for adequate, reliable electric service. The regional councils are also responsible for preparing an annual report to the Economic Regulatory Administration, based on the operations and projections of its member systems for the succeeding ten years. The six ORBES states include sections of five reliability council regions (Figure 7):

East Central Area Reliability Coordination Agreement (ECAR)
Mid-Atlantic Area Council (MAAC)
Mid-America Interpool Network (MAIN)
Mid Continent Area Reliability Coordination Agreement (MARCA)
Southeastern Electric Reliability Council (SERC)

A complete listing of reliability council members in the ORBES states is shown in Table 3.

Fig. 7 Regional Reliability Councils


ECAR
East Central Area Reliability Coordination Agreement
MAIN
Mid–America Interpool Network
SERC
Southeastern Electric Reliability Council
ERCOT
Electric Reliability Council of Texas
MARCA
Mid–Continent Area Reliability Coordination Agreement
SPP
Southwest Power Pool
MAAC
Mid Atlantic Area Council
NPCC
Northeast Power Coordinating Council
WSCC
Western Systems Coordinating Council

SOURCE: National Electric Reliability Council, 1977 Annual Report ( March, 1978 ) p. 2

## TABLE 3

## RELIABILITY COUNCIL MEMBERSHIP IN THE ORBES STATES

- East Central Area Reliability Coordination Agreement (ECAR)
  - Bulk Member Systems
    - Appalachian Power Co. (American Electric Power System)
    - The Cincinnati Gas and Electric Co.
    - The Cleveland Electric Illuminating Co.
    - Columbus and Southern Ohio Electric Co.
    - The Dayton Power and Light Co.
    - Duquesne Light Co.
    - East Kentucky Power Cooperative
    - Indiana & Michigan Electric Co. (American Electric Power System)
    - Indiana-Kentucky Electric Corp. (Ohio Valley Electric Corp.)
    - Indianapolis Power and Light Co.
    - Kentucky Power Co. (American Electric Power)
    - Kentucky Utilities Co.
    - Louisville Gas and Electric Co.
    - Monogahela Power Co. (Allegheny Power System)
    - Northern Indiana Public Service Co.
    - Ohio Edison Co.
    - Ohio Power Co. (American Electric Power System)
    - Ohio Valley Electric Corp.
    - Pennsylvania Power Co. (Ohio Edison Co.)
    - Potomac Edison Co. (Allegheny Power System)
    - Public Service Co. of Indiana, Inc.
    - Southern Indiana Gas and Electric Co.
    - Toledo Edison Co
    - West Penn Power Co. (Allegheny Power System)
  - Liaison Member Systems[1]
    - Richmond (IN) Power and Light
    - Hoosier Energy Division
    - Henderson (KY) Municipal Power and Light
    - Owensboro (KY) Municipal Utilities
    - Big Rivers Electric Corp.
    - Division of Light and Power - City of Cleveland
    - City of Hamilton (OH) - Department of Pbulic Utilities - Electric Division
    - Buckeye Power Incorporated
    - Wabash Valley Power Association

- Mid-Atlantic Area Council (MAAC)
  - Regular Members
    - Metropolitan Edison Co. (General Public Utilities)
    - Pennsylvania Electric Co. (General Public Utilities)
    - Pennsylvania Power & Light Co.
    - Philadelphia Electric Co.
    - UGI Corp.
  - Associate Member[1]
    - Allegheny Electric Cooperative

- Mid-America Interpool Network (MAIN)
  - Regular Members
    - Commonwealth Edison Co.
    - Illinois Group
      - Central Illinois Light Co.
      - Central Illinois Public Service Co.
      - Illinois Power Co.
      - Southern Illinois Power Cooperative
      - Springfield-City Water Light and Power
    - Missouri Group
      - Union Electric Co.
  - Associate Members[1]
    - Association of Illinois Electric Cooperatives
    - Soyland Power Cooperative
    - Western Illinois Power Cooperative

- Mid Continent Area Reliability Coordination Agreement (MARCA)
  - Interstate Power Co.
  - Iowa-Illinois Gas and Electric Co.

- Southeastern Electric Reliability Council (SERC)
  - Southeastern Power Administration
  - Tennessee Valley Authority

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SOURCES: East Central Area Reliability Coordination Agreement. Regional Reliability Council Coordinated Bulk Power Supply Program Volume II. April 1, 1979, p. 1-ii.

Mid-Atlantic Area Council. Regional Reliability Council Coordinated Bulk Power Supply Program. April 1, 1979.

Mid-America Interpool Network. Regional Reliability Council Coordinated Bulk Power Supply Program. April 1, 1979, p. 1.

Mid-Continent Area Reliability Coordination Agreement. Regional Reliability Council Bulk Power Supply Program. April 1, 1979, p. I-6.

National Electric Reliability Council. 1977 Annual Report. March 1978, p. 28.

[1] Liason and associate members include municipal and cooperative utilities which do not have a significant effect on system reliability.

The question of reliability provisions were addressed again in the Public Utility Regulatory Policies Act of 1978. However, to date, there has been no clear and consistent interpretation of this act. The relationships between reliability councils may also need examining. On March 13, 1979, in testimony before the Senate Energy Committee, former Energy Secretary, James Schlesinger reminded the group that the Public Utility Regulatory Policies Act permitted "wheeling" of electric power from regions where it is generated by coal-burning plants to regions where oil is the primary generating fuel. If such were to occur, linkages between reliability councils would likely need strengthening. Furthermore, the institutional impacts must be examined by both the government and the utility industry. For example, Governor John D. Rockefeller of West Virginia was reportedly seeking the support of the Department of Energy to encourage utilities in the East to locate new power plants in the Ohio Valley and in Appalachia, close to coal reserves. Such a development would exacerbate the energy-environment conflicts which gave rise to the ORBES study. In addition, the new institutional arrangements resulting from such a development would have major significance for the ORBES states.

## Institutional Arrangements

### The Investor-Owned Electric Power Industry and the Federal Government

The national government first became involved in energy regulation and management through water power. Under its authority to regulate interstate commerce, Congress vested in the War Department (now the Department of Defense) supervisory control over all structures, including water-power plants, insofar as they affected navigation. Because the Federal government was a major land holder in the western states, it also became necessary to formulate a policy with regard to the use of power sites on the public lands. Through the promotion of irrigation, the government became interested in the generation of power as a by-product of its water supply units as well. Federal activity increased further during World War I, when the government constructed a hydroelectric project at Muscle Shoals in northern Alabama to provide power for the production of synthetic nitrate.

Finally, with the growth of great companies engaged in transmitting across state boundaries, problems in the regulation of interstate commerce were presented to Congress. Amid such circumstances, federal control over the development of electric power became a major political and economic issue. In the 1920's, the industry began to construct and operate local plants to serve single cities or communities. Increasingly, however, local plants expanded their service territories and consolidated their holdings to take advantage of load diversity between differing areas, to realize economies of scale in generating stations, and to introduce some degree of standardization in equipment and methods.[4] In an era when formation of "trusts" was common, the business of corporate consolidation posed few problems. This extreme concentration of utility firms was accomplished by use of the holding company.

Generally, such holding companies were beyond the control of the various state commissions. As a result, it was widely felt that the values of the holding company techniques were offset by its abuses. Concern over inflated valuations, watered stock and feverish speculation in securities of companies often several steps removed from the actual operating level led, in 1928, to a Federal Trade Commission investigation.

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[4] Electrical World: 100th Anniversary Issue (June 1, 1974) p.44

That study and others revealed that by 1930 the country was covered by networks of gigantic electrical companies owning and operating plants in many localities. In the meantime, by mergers, these companies had apparently achieved remarkable economies in operation. Yet these reports emphasized that these developments were accompanied by popular resentment. Protests were heard frequently against high rates, the issuance of stocks and bonds that became worthless or of little value, propaganda against public control and ownership, and lobbying scandals.

These massive power networks made the electric power industry largely interstate in character, as electricity was transmitted across state boundaries and holding companies operated virtually all over the country. Out of this situation and the accompanying studies grew popular demands for the federal regulation of holding companies and of interstate operations of electric power firms. As a result, the Federal Power Act was passed in 1935. This Act, also called the Public Utility Holding Company Act of 1935, is discussed in greater detail in Chapter VIII.

## Historical Growth of American Electric Power System

American Electric Power (AEPS) began in 1906, when it was incorporated in New York as the holding company American Gas and Electric Company (AGEC). It was re-incorporated in 1925, as a consolidation of American Gas and Electric Company and Appalachian Securities Corporation. (In turn, AGEC was a subsidiary of the registered holding company of Electric Bond and Share Company of America, until 1945). At this time, AGEC's twelve electric utility companies operating in Ohio, Indiana, Michigan, Virginia, West Virginia, Kentucky, Tennessee, New Jersey and Pennsylvania were divided into three sectional groups, none of which was connected with any other.

The Central System of AGEC was retained as the principal completely integrated system when the Public Utility Holding Company Act forced the dissolution of the large holding companies. It became the American Electric Power System in May 1958.

Today, the AEPS system is easily the largest investor-owned power system in the ORBES study region, both from the standpoint of electric generation and electricity sales. It serves nearly 2 million customers in 2,940 communities. Moreover, at the present time AEPS owns, controls or has surface rights to more than 3.3 billion tons of recoverable coal.

AEPS serves a sizeable portion of Kentucky, Ohio and West Virginia. A bid to purchase Columbus and Southern Ohio Electric Company (COSO), made while they were still AGEC, would have greatly expanded their influence in the ORBES states. The initial application requested approval from the FPC to bid on the purchase of 99 percent of common stock of COSO (then a subsidiary of United Light and Railways Company). The area of COSO was contiguous with Ohio Power Company, a subsidiary of AGEC. However, the FPC concluded that this purchase would represent a major extension into new territory, and denied its permission.

In 1968, AEPS again proposed the acquisition through an exchange of 1.3 shares of AEPS common stock for each share of COSO. Both AEPS and COSO filed motions with SEC, which must approve the sale, urging it to expedite a decision concerning the acquisition. COSO has emphasized that the prolonged delay of the proceedings has restricted its financing plans over the past years and that these restrictions would be expected in the future until the matter is resolved.

In 1978, the SEC approved the acquisition in principle. This tentative approval was subject to the resolution of two remaining issues: (1) objections by several local municipal systems and (2) "fairness" in exchange offers involving stockholders of the two corporations. After the necessary substantiating materials were submitted to the SEC in 1979, proceedings were closed. However, the Commission has not yet released its decision.[5]

## The Allegheny Power System

The second holding company with operating utilities in the ORBES states is the Allegheny Power Systems, Inc. (APSI). Two of its three operating companies -- the West Penn Power Company and the Monongahela Power Company -- are located squarely in the ORBES region. The third, the Potomac Edison Company, is located on the periphery of the region.

APSI was established in Maryland nearly sixty (60) years ago as the West Penn Electric Company. The company was formed to acquire control of the electric, gas, transportation and certain other subsidiaries of American Water Works and Electric Company (AWWEC) which had electric utility operations in West Virginia, Pennsylvania, Ohio, Virginia and Maryland. AWWEC also supplied gas to users in West Virginia, Pennsylvania and Maryland, but gas operations were small compared to the electric operations.

West Penn Electric Company adopted its present name, Allegheny Power System, Inc., in November of 1960. By 1976, the APSI system served customers in Pennsylvania, West Virginia, Maryland, Ohio and Virginia, with a generating capacity of 6,429 megawatts.

## General Public Utilities

General Public Utilities (GPU) is the third holding company in the ORBES states providing electric service to customers in New Jersey and Pennsylvania.

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[5] In February 1980, the Securities and Exchange Commission approved American Electric Power's request to acquire Columbus and Southern Ohio Electric Company, subject to approval by at least 80 percent of the shareholders of Columbus and Southern Ohio Electric Company.

At the end of 1977, the three subsidiaries which make up GPU owned 44 generating stations with a net effective capability of 7,190 MWe.

Metropolitan Edison Company, Pennsylvania Electric Company, and Jersey Central Power and Light Company jointly own Three-Mile Island nuclear station. Metropolitan Edison, the operator, owns 50 percent of the plant, while Jersey Central and Pennsylvania Electric each own 25 percent. The 1979 accident at the Three-Mile Island facility caused extensive physical damage to the reactor and heightened public concern about the safety of nuclear facilities. The estimated cost of repair of Three-Mile Island is of the order of 500 million dollars, and this factor coupled with the uncertainty in the scheduling of the repairs has created financial problems for all three companies. These have yet to be fully resolved and the full impacts of the accident have not yet been evaluated.

## CHAPTER III

# PUBLICLY-OWNED UTILITIES AND POWER AGENCIES

## Organizational Framework

Another class of utilities is the publicly-owned utilities and power agencies. There are three levels of public ownership found in the ORBES states:

Municipal utility (village, town, or city)

Regional utility (county or district)

Federal Power Agency

The state power agency is another level of publicly-owned utility. However, none of the six ORBES states operate any generating or distribution facilities, although some state institutions such as state universities may generate their own power.

## Municipal Utilities

Municipal utilities are owned and/or operated by a municipal government to serve customers within the corporate limits. Today, municipals outnumber the major investor-owned utilities in the ORBES states approximately 7 to 1; 264 such companies are located in the six-state region. Eighty-three are in Ohio, followed by Indiana with 74, Illinois with 41, Pennsylvania with 34, Kentucky with 30 and West Virginia with 2. (A listing of the larger publicly-owned utilities is included in Appendix C). Despite the numerical advantage, the municipal utilities supplied only one percent of the six-state region's electrical power in 1978.[1]

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[1] U.S. Department of Energy, Energy Information Administration, "EIA Report on Preliminary Power Production, Fuel Consumption and Installed Capacity for 1978" Energy Data Report, May 1979, p. 37.

Fifty-three municipals in the ORBES states have some generating capability which is used to produce all or a portion of the power needed for the community. Nearly 66 percent of these generating utilities have annual operating revenues in excess of $1 million. However, in some cases, such as Fort Wayne City Utilities, the utility's generating capacity is leased to a private utility for use within the system.

The remaining municipal utilities have no generating capability. They rely solely on purchased power to meet their customer demands.

### Regional Utilities

The Chicago Metropolitan Sanitary District (MSD) is the only special district in the six-state region which maintains generating capacity. The MSD is responsible for solid waste disposal operations in and around Chicago. Thus, its 41 Mwe capacity is used to provide power for its various functions.

### Federal Power Agencies

The Tennessee Valley Authority and the U.S. Army Corps of Engineers are the only federal power agencies operating in the ORBES states. The three TVA plants and three Army Corps plants, all in Kentucky, produce approximately four percent of the total power generated in the ORBES states.[2] Of all the ORBES states, Kentucky is the only one using substantial amounts of federally-generated power. This power is either marketed directly to the consumer by the Department of the Interior, Southeastern Power Administration or purchased by individual utilities or cooperatives for distribution along their own transmission lines.

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[2] "EIA Report on Preliminary Power Production," p. 37.

## Institutional Arrangements

### Growth of the
### Municipal Electric Utility

Municipal ownership of electric utilities grew during the first three decades of the electric utility industry primarily in areas where private electric services were not available. In addition, municipal ownership was an alternative to state regulation. The public was supposed to benefit from publicly-owned utilities in two ways: (1) those served by the city electrical system enjoyed the low price directly; and (2) those not served, enjoyed the benefits of having a yardstick against which to measure their own prices. Occasionally, the competition between the public and private sector was direct. For example, in such cities as Cleveland, Ohio; Columbus, Ohio; and Los Angeles, California residents had a choice of hooking up with either municipal or private electricity. Proponents of the municipal approach argue that as a result, these cities (for a time) had some of the cheapest power in the country.

During the 1920s, the trend toward municipal ownership reversed as more areas were integrated into the private sector. This trend was reversed in the 1930s (although private ownership has always predominated) when the development of new technology apparently made small operations economic for a time and perceived abuses in the private sector soured the public on privately-owned electric utilities.

Opponents of the municipal power approach cite at least four basic obstacles, aside from charter limitations, which inhibit a return to municipal ownership:

1) Damages and severance charges may have to be paid to an existing private firm.
2) A financing problem may arise. Public funds must be available to pay for seizure or severance, and on-going capital investment will be necessary.

3) The municipal boundary limits may not constitute an efficient unit of distribution or production; thus, prices may not be as low as anticipated.

4) Where alternative sources of power supply are not available, the city may become a captive customer of the private utility which previously owned its distribution system.

Apparently, the obstacles to municipal ownership are great enough that few cities today embark on this route. The number of municipal power enterprises nationwide has declined from a high of 3,084 cities in 1923 to less than 2,000 at the present time. Most of those that remain, purchase power from the investor-owned utilities. As a result, they are confronted with institutional problems of trying to keep prices as low as possible while having to pay the utility at the rates set by the state.

## The Federally-Owned Power System

As indicated earlier, the Federal government constructed a dam on the Tennessee River in northern Alabama at Muscle Shoals to aid in the manufacture of synthetic nitrates for explosives. When the construction of the dam and the nitrates plant ended in 1925, the logic of government ownership of a war-born production dam and plant disappeared. For a time, the dam moved into private hands. However, after several false starts in attempting to regain ownership of the dam, the Congress finally acquired the facility for the federal government in 1933, the same year President Franklin D. Roosevelt signed the Tennessee Valley Authority Act.

This new legislation provided for the total development of the valley. One major objective was to generate electric power for residents of the TVA region. At first such power was provided totally by the Muscle Shoals installation, later renamed the Wilson Dam, and others which followed it. Slowly, however, coal-fired steam plants were built, and today more power is generated in these plants than by hydro-electric power.

Because of its institutional importance, the TVA can have a considerable impact in the ORBES states. In fact, the TVA may be changing its traditional stance as a champion of energy growth. According to the Wall Street Journal, a recent TVA report to President Carter recommended that further expansion of existing energy companies be opposed. Coal and uranium markets "aren't only dangerously concentrated, but are also dominated by companies with other energy interests." The report which was prepared by the TVA general counsel also argued that "the high concentration in these markets is likely to lead to collusion among energy suppliers, as well as higher prices and smaller supplies."[3]

The report by the huge government-owned electric utility urged that mergers leading to a further concentration in the industry be prevented mainly through litigation and legislation. It pushes for legislation that would prevent energy companies from acquiring interests in more than one of what the report calls the three primary fuels -- petroleum, coal and uranium.

It also suggests that the government provide assistance to small coal and uranium producers to allow them to compete more effectively with larger energy companies. If federal agencies fail to take legal action to prevent anticompetitive merges in the energy industry, the report asserts, then TVA itself should file suit to prevent them. If the leadership of TVA is fully behind these suggestions, it seems probable that a shift in overall TVA policy could have an impact on the broad electric utility industry in the ORBES states and elsewhere.

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[3] Wall Street Journal, March 26, 1979.

# CHAPTER IV

# RURAL ELECTRIC COOPERATIVES

## Organizational Framework

The rural electric cooperatives (REC) are the third component in the structure of the electric utility industry, providing power to farms and rural areas not otherwise served by investor-owned or public utilities. The six-state region supports 145 cooperatives ranging from 44 in Indiana to 1 in West Virginia. Appendix C contains a complete listing.

There are three levels of REC. The basic unit is the distribution cooperative, which predominates in the ORBES states. Such a cooperative must purchase power from a nearby investor-owned utility, a federal power agency, or from a generating cooperative. On the average, each one has a service area of one or two counties.

In some states, the REC's are affiliated into a "super-cooperative" which acts as a purchasing agent for all its associated cooperatives. Two such organizations are Buckeye Power, Inc., which distributes power to all the REC's in Ohio and Allegheny Electric Power Cooperative in Pennsylvania. Moreover, Allegheny owns 10 percent of the Susquehanna Nuclear Plant under construction.

Other rural electric cooperatives also currently own or are planning to own generating capacity, usually in conjunction with an investor-owned utility. Like the "super-cooperative," they supply power to a network of affiliated distribution cooperatives. The seven generating cooperatives in the ORBES states are:

Southern Illinois Power Cooperative

Soyland Power Cooperative (Illinois)

Western Illinois Power Cooperative

Wabash Valley Power Association (Indiana)

Hoosier Energy Division; Indiana Statewide Rural Electric Corp.

Big Rivers Electric Corporation (Kentucky)

East Kentucky Power Cooperative

Western Illinois Power Cooperative and Hoosier Energy Division, do not generate enough power to supply all their customers. Therefore, they purchase additional power, for distribution through their systems.

## Institutional Arrangements

### The Rural Electric Cooperative Movement

About 2 percent of all electric power in the ORBES states is generated by the rural electric cooperatives.[1] However, as in the case of municipal utilities, this figure is not indicative of the importance of the rural electric cooperative in the broad electric power industry.

The institutional development of the electric cooperative began in 1932 with the election of President Franklin D. Roosevelt. At that time, private and municipal utilities service was confined to the cities and towns where many customers per mile of line could be connected. However, Roosevelt decided to extend the power policies he had developed while governor of New York. His ideas were supported by other innovators with similar goals. In May of 1935, Roosevelt signed an executive order creating the Rural Electrification Administration (REA). Congress incorporated the program into the Emergency Relief Act of 1935, and Roosevelt named Morris Cooke, a vocal supporter of Roosevelt's energy policy and a critic of the existing utilities, to head the agency. The initial efforts made by Roosevelt and Cooke to bring electric service to the individual farmer through the REA were not successful. They attempted to arrange for farmers to buy power from the private companies, because they felt that the well established investor-owned utilities had the knowledge and equipment to do the job. However, the privately-owned utilities refused to supply the power and so they turned to the municipally-owned utilities. The municipal company option proved unsatisfactory as well, because they had little enthusiasm for extensions that would neither serve their own residents nor return much profit. Also, a series of adverse court decisions cast doubt on their legal right to provide electricity beyond their city boundaries.

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[1] "EIA Report on Preliminary Power Production" p. 37.

Finally, Cooke turned to the concept of a cooperative for farmers as a solution. One model he used was a pioneering venture begun in Alcorn County, Mississippi, where a group of farmers known as Alcorn Associates, had formed a cooperative to buy power from the Tennessee Valley Authority (TVA). The cooperative strung one-hundred miles of wire, charged rates no higher than those being charged in the surrounding towns and made enough profit in one year to repay half of the funds that TVA had loaned in the previous year to establish the service.

Cooke proposed that local cooperatives such as Alcorn Associates be organized to seek funds from the Federal Rural Electrification Administration (REA). This required that REA be strengthened as a loan agency and its original mission as a relief agency be phased out. The enabling legislation became known as the Rural Electrification Act (Norris-Rayburn Act). Under the Act, farmers had a clear incentive to work for speedy electrification. Thus, the rural electric cooperative became the chief vehicle of rural electrification, serving all farms in the community, not just the most profitable ones.

By 1974, \$64 billion on federally backed long term, low interest loans had been extended to 1,000 borrowers serving 5.8 million customers in 46 states.[2] As a result, rural electrification was extended to 94 percent of the farms in the United States in the first twenty years following passage of the REA Act, and now exceeds 98 percent of all farms.

## Institutional Affiliations

Institutionally, the rural cooperative is a legal form of business similar to a corporation, except that ownership is vested in members rather than stockholders. All benefits are in the form of products or services rather than profits.

Most cooperatives in the ORBES states are affiliated with the National Rural Electric Cooperative (NRECA), a non-profit organization serving rural electric systems. NERCA coordinates a variety of services for its members, including management training, insurance and safety programs, legislative representation, and public relations.

Each state also maintains a state-wide association of cooperatives. These state organizations have similar goals -- providing to its members the advantage of larger utility operation, while retaining local control and ownership.

The National Rural Utilities Cooperative Finance Corporation (CFC) is another non-profit organization serving member cooperatives (including nearly all those in the ORBES states). It was created in 1969 to provide private capital to the rural electric cooperatives to supplement the government financing available through the Rural Electrification Administration (REA) loan program, particularly for generation and transmission facilities.

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[2] Martin J. Farris and Roy J. Sampson, Regulation, Management and Ownership, (Boston: Houghton Mifflen Co., 1968; reprint ed., 1976).

# CHAPTER V

# ELECTRICAL GENERATION SYSTEMS

Because of the large number of utilities serving the ORBES states it is more useful to analyze the industry in terms of a regional system rather than at the level of the individual utility. This approach is appropriate too, because the high degree of interconnection among the utilities in the six states allows power to be sent to any area in need of additional electricity. Such ties are stimulated by the independent power pools and power consortia as well as by the national and regional reliability councils.

## Electric Generation

### Generating Capacity

The total installed capacity represents the maximum amount of power instantaneously available, assuming every generating unit in the system is operating at full capacity. However, in a system as large as the one encompassing the ORBES states, it is highly unlikely that any utility will be operating at full capacity in any given instant. On a yearly basis, coal plants operate with a capacity factor of about 50 percent while nuclear plants operate at a 60-65 percent capacity factor.[1] However, these factors vary widely from plant to plant as well as from company to company. Thus, the system usually operates at some percentage of capacity, depending on the generating unit availability and the customer demand for electricity.

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[1] Capacity factor is defined as: $\frac{\text{Actual Mwh generated per year}}{\text{Unit Capacity (MW) x 8760 hours/year}}$

In most ORBES states, there is a strong correlation between the amount of installed capacity and the state population. Thus, most of the capacity in the six-state region is found in Pennsylvania, Ohio and Illinois (Table 4). West Virginia is the exception. The state, which has only 4 percent of the area's population, contains nearly 11 percent of the installed capacity. As a result, West Virginia exports nearly twice as much power as is used in the state. This is largely due to the fact that the American Electric Power System (AEPS) owns the majority of the generating facilities in the state. Because AEPS is a totally integrated system, power required at one location may be generated many miles away. State lines are meaningless within the AEPS system.

Power plants must be located near a good supply of water. Therefore, most of the capacity is located along major rivers and the Great Lakes, with clusters adjacent to the metropolitan areas which constitute the utilities' major load centers (Figure 8). More specifically, more than 60 percent of the six-state capacity is within the Ohio River drainage system; 28.7 percent is located on the main stem of the Ohio River and 31.8 percent is located on its tributaries.

Coal, oil, and nuclear power provide most of the capacity in the six-state area, however, coal is the single most important fuel in the region. Coal fired capacity is found in all six states, but nearly 60 percent of it is sited in Ohio, Illinois and Pennsylvania. About 32 percent of the coal-fired capacity is found along the main stem (Figure 9). Ohio-based utilities, in particular, have located extensively along the Ohio River. In other states, primarily West Virginia, Pennsylvania and Kentucky, the majority of coal-fired capacity is located on the tributaries of the Ohio River.

Historically, nuclear capacity had been increasing in the ORBES states. The uncertainties associated with public acceptability and regulatory constraints have resulted in a slowdown in orders for new nuclear units. In 1975, ten commercial-sized reactors were in operation in the six-state region: seven were

## TABLE 4

## GENERATING CAPACITY SUMMARY - 1975
## SIX-STATE REGION

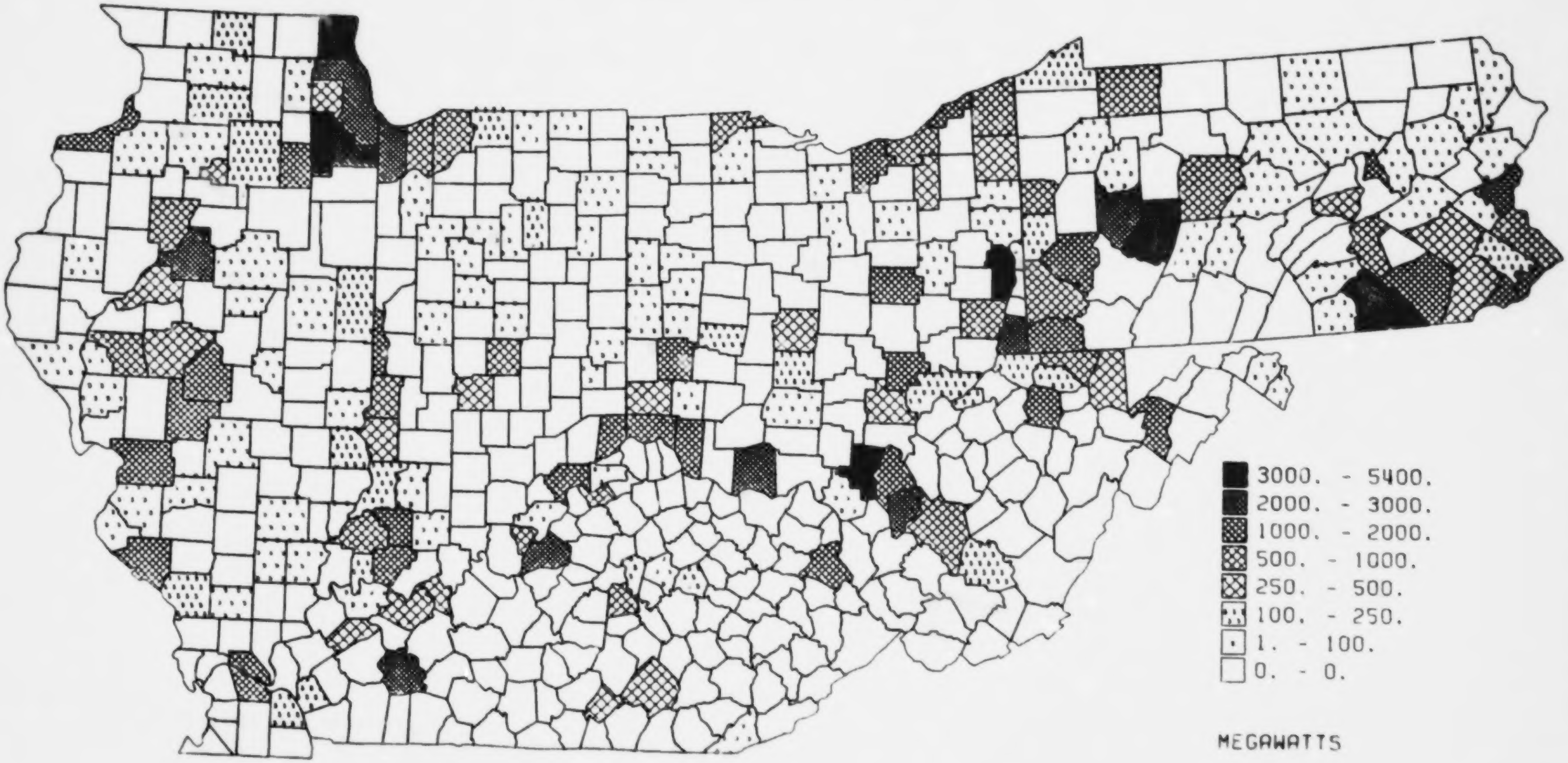
| | COAL | NUCLEAR | PETROLEUM | NATURAL GAS | HYDRO[a] | OTHER[b] | TOTAL MWe | % |
|---|---|---|---|---|---|---|---|---|
| 1975 Capacity MWe | | | | | | | | |
| Illinois | 15,801 | 5,717 | 4,058 | 204 | 34 | 197 | 26,011 | 22.3 |
| Indiana | 13,104 | - | 1,166 | 110 | 114 | 324 | 14,818 | 12.7 |
| Kentucky | 10,948 | - | 121 | 128 | 679 | - | 11,876 | 10.2 |
| Ohio | 21,266 | - | 2,700 | 71 | 1 | 626 | 24,664 | 21.1 |
| Pennsylvania | 15,517 | 2,904 | 5,818 | 19 | 1,717 | 815 | 26,790 | 22.9 |
| West Virginia | 11,966 | - | 12 | - | 205 | 387 | 12,570 | 10.8 |
| TOTAL | 88,602 | 8,621 | 13,875 | 532 | 2,750 | 2,349 | 116,729 | 100.0 |
| % | 75.9 | 7.4 | 11.9 | 0.4 | 2.4 | 2.0 | 100 | |
| 1985 Capacity MWe | 118,572 | 33,240 | 14,087 | 456 | 3,037 | 3,493 | 172,885 | |
| 1975-1985 MWe Change, Net | 29,970 | 24,619 | 212 | 76 | 387 | 1,144 | 56,156 | |
| 1975-1985, % Change | + 33.8 | + 285.6 | + 1.5 | - 14.3 | + 10.4 | + 32.8 | + 48.1 | |

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, prepared for the Ohio River Basin Energy Study (November 1978).

[a] Includes hydro and pumped storage.

[b] Includes refuse, waste heat, multi-fueled and unknown fuel types.

Fig. 8 Total Installed Generating Capacity: 1975


3000. - 5400.
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1. - 100.
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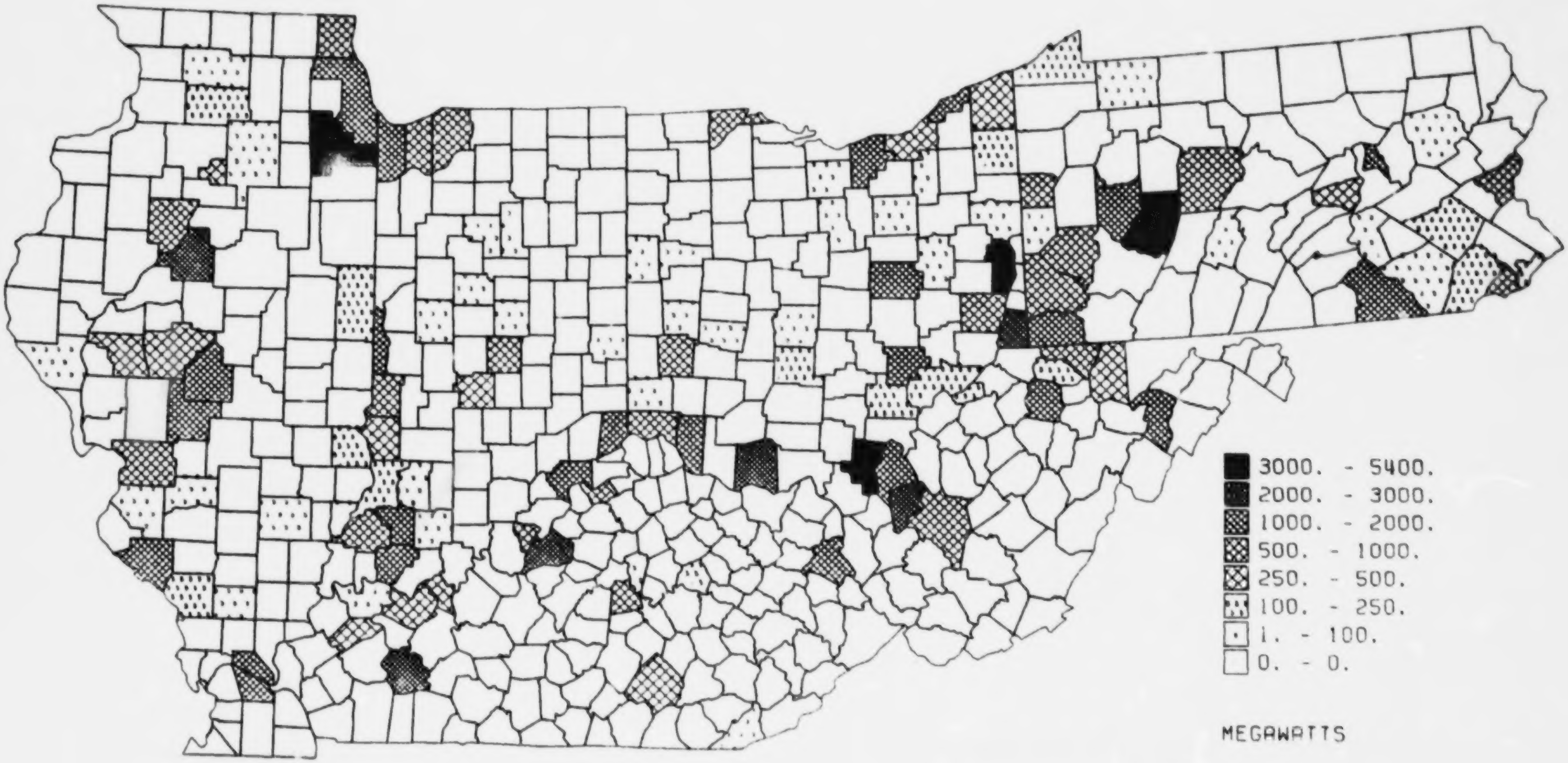
MEGAWATTS

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

Fig. 9 Total Installed Coal-Fired Generating Capacity: 1975


■ 3000. - 5400.
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▦ 1000. - 2000.
▨ 500. - 1000.
▧ 250. - 500.
░ 100. - 250.
⊡ 1. - 100.
☐ 0. - 0.
MEGAWATTS

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

located at three sites in northern Illinois and three reactors were located at two sites in eastern Pennsylvania (Figure 10). In addition, there was a 60 MWe reactor near Shippingport, Pennsylvania. This reactor was operated by Duquesne Electric Company for the federal government, primarily as an experimental plant, although it did provide power to the surrounding community, and was thus classified as a commercial reactor.

By 1978, four additional units, totaling 2778 MWe of capacity, were on-line, including a new 60 MWe experimental breeder reactor built on the site of the earlier experimental station at Shippingport, Pennsylvania.[2] Because it was constructed as an experimental plant, consideration is now being given to its decommissioning. Additional commercial nuclear plants are under construction in all ORBES states, except Kentucky and West Virginia.

## Actual Generation

The amount of electricity actually generated during the year is based on demand from both the final consumer and inter-utility bulk sales. In 1975, nearly one half billion MWh of electricity were generated in the six-state region, of this, 86.5 percent came from coal, 8.0 percent from nuclear power, 3.2 percent from petroleum, 1.3 percent from hydro and 1.0 percent from natural gas. These percentages do not coincide with breakdown of capacity by fuel types. Nuclear and coal-fired plants are base-loaded units. They are used whenever possible, thus providing a relatively constant level of generation. As a result, these two fuel types provide a greater percentage of the generated electricity than indicated by their contribution to the installed capacity.

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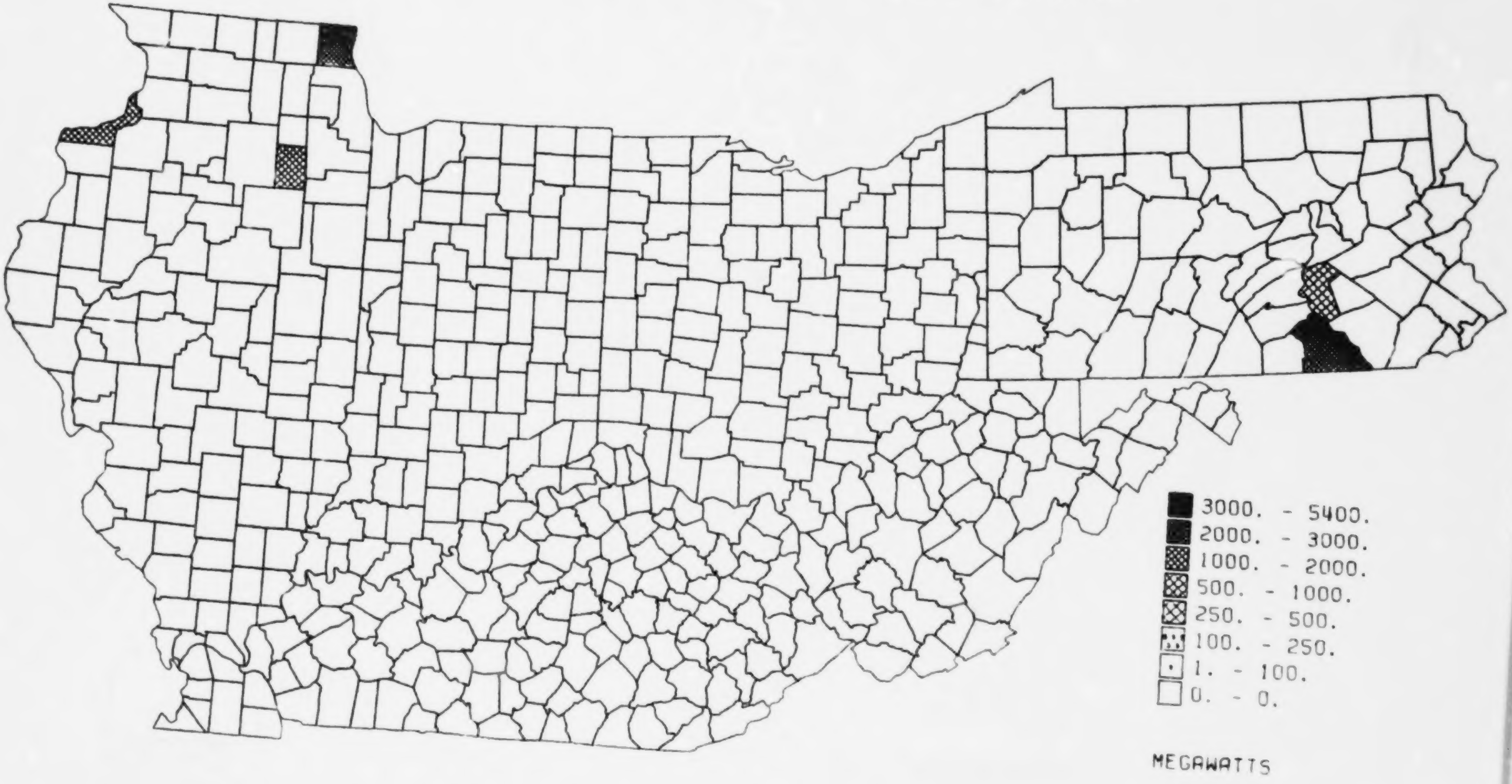
[2] This figure includes the capacity contributed by both units at Metropolitan Edison's Three Mile Island Station, which was shut down following the accident in March 1979.

Fig. 10 Total Installed Nuclear Generating Capacity: 1975


3000. - 5400.
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100. - 250.
1. - 100.
0. - 0.
MEGAWATTS

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

## Power Transmission

### Transmission System

The bulk electric power produced at the generating plant is transported to other portions of the system through the transmission network. This network consists of the transformers, which change the voltage of the electricity and the transmission lines which carry the power.

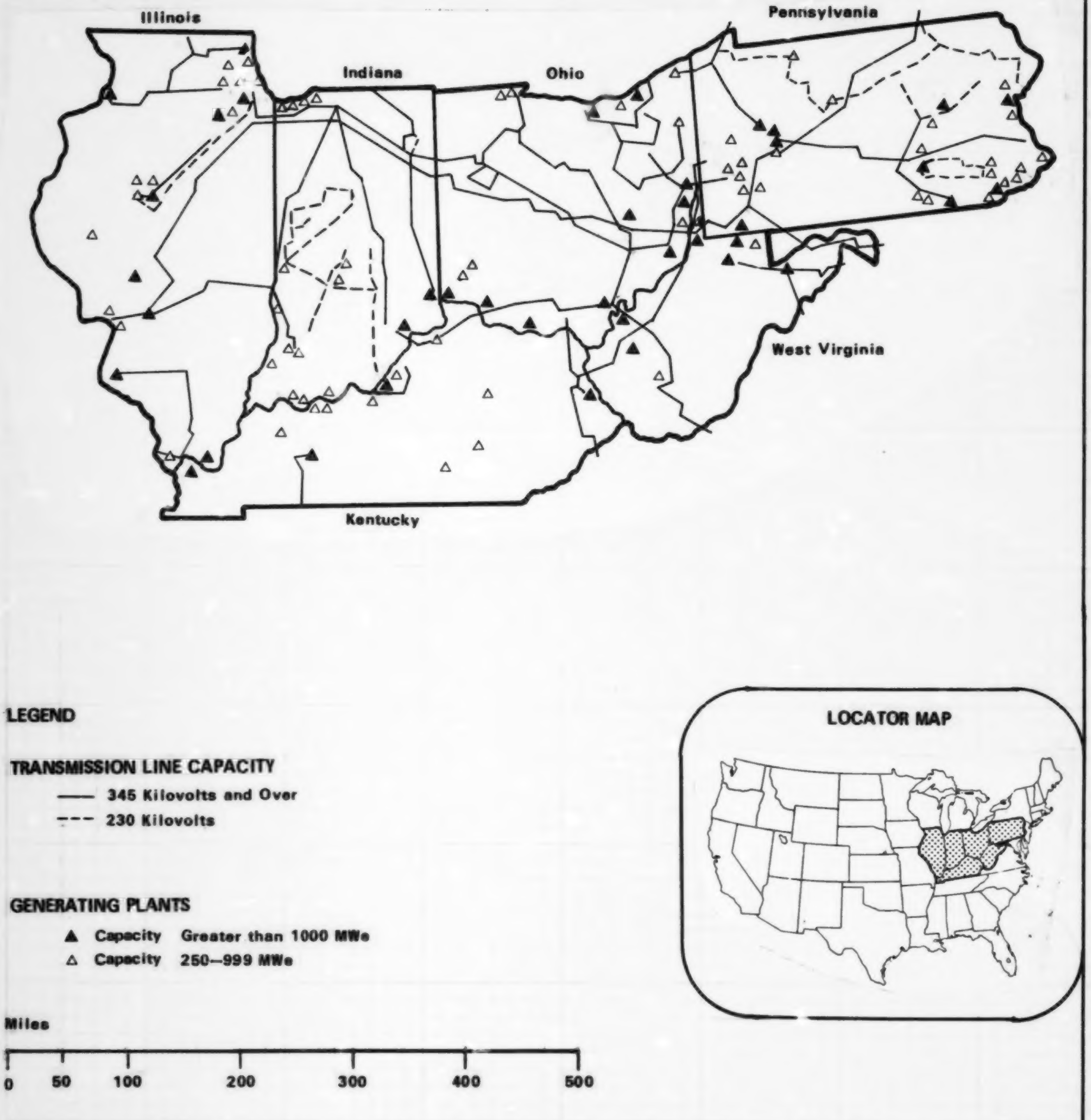
The transmission lines are the most extensive aspect of this system. They form a network of high voltage (69-161 KV) and extra high voltage (230-765 KV) lines which connect the generating stations to the load centers. The system includes substantial intra-system, intra-regional, and inter-regional transmission ties, thus creating a well interconnected power grid which allows power to be sent by numerous, redundant pathways to the final user (Figure 11).

### Utility Interconnections

A utility interconnection is defined as a transmission link between two individual utilities. These connections are most important in the context of the regional reliability councils. Member utilities are highly interconnected in order to stabilize the regional system and provide for a more economical power supply. Thus, in the event of an accidental breakdown at a key generating plant or transmission line, or an unexpectedly high level of demand, power from other plants in the system can be used to make up the deficiency, decreasing the chances of a blackout or brownout. Connections are made between regional reliability councils for the same purpose.

Such a transmission is mandated by the National Electric Reliability Council. Each regional council is responsible for planning a network with a high degree of reliability, and testing it under a variety of simulated conditions. As with generation capacity, transmission line additions must be planned well

# Fig. 11 Major Generating Units and Transmission Lines in the Six ORBES States


Illinois
Indiana
Ohio
Pennsylvania
West Virginia
Kentucky
LEGEND
TRANSMISSION LINE CAPACITY
345 Kilovolts and Over
230 Kilovolts
GENERATING PLANTS
▲ Capacity Greater than 1000 MWe
△ Capacity 250—999 MWe
Miles
0
50
100
200
300
400
500
LOCATOR MAP

SOUCE: Congressional Research Service for the US. Senate Committee on Natural Resources, National Energy Transportation; Volume I, Current Systems and Movements, Map 14 ( Washington D.C.: May 1977 ) Publication 95—15 and Steven D. Jansen, Electric Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November 1978) in advance of demand. New lines are needed for a variety of reasons: to relieve overloads, to provide area protection, to increase interchange capability, for stability considerations, or to deliver generation output.[3]

## Capacity Exchanges[4]

The system's interconnections are also used to maintain day-to-day service through the use of "capacity exchanges." The utilities depend on the grid to help meet the demand for power because no single utility can exactly predict the amount of electricity required to supply the demand. Excess electricity from one company is routinely sold to another utility in need of additional power. Many utilities have firm commitments to purchase power if their available capacity is not sufficient, such as during times of peak demand.

Capacity exchanges usually occur between power pool affiliates or among neighboring utilities. This also takes place between regional reliability councils. This capability is used in power "wheeling," where the transmission facilities of one system is used to transmit power of and for another system.

In terms of firm commitments for capacity exchanges, MAIN is neither a net exporter nor a net importer of power (Table 5). The projections of the reliability councils for 1977-1986 indicate that MAIN, as a whole, will be a net importer of power during the summer for the entire reporting period and a net exporter of power during the winter, except for 1979 through 1982 when winter exports nearly balance winter imports.

---

[3] Detailed plans for proposed new lines are included in the annual reports issued by each reliability council.

[4] Detailed data on exchanges by individual companies can be found in the company's annual report or in the yearly report from the Reliability Council to which it belongs.

## TABLE 5

## SUMMARY OF SCHEDULED CAPACITY EXCHANGES INTO OR OUT OF ECAR AND MAIN 1977-1986

Scheduled Imports

| | ECAR | | MAIN | |
|---|---|---|---|---|
| | Summer | Winter | Summer | Winter |
| 1977 | 704 | 1,112 | 2,074 | 1,114 |
| 1978 | 594 | 902 | 1,832 | 1,072 |
| 1979 | 493 | 801 | 1,522 | 1,262 |
| 1980 | 483 | 989 | 1,522 | 1,262 |
| 1981 | 728 | 1,228 | 1,552 | 1,292 |
| 1982 | 921 | 1,229 | 1,552 | 1,292 |
| 1983 | 872 | 1,372 | 1,240 | 780 |
| 1984 | 1,013 | 1,321 | 1,240 | 980 |
| 1985 | 957 | 1,265 | 1,240 | 980 |
| 1986 | 894 | 1,202 | 1,240 | 980 |

Scheduled Exports

| | ECAR | | MAIN | |
|---|---|---|---|---|
| | Summer | Winter | Summer | Winter |
| 1977 | 2,479 | 2,052 | 880 | 1,729 |
| 1978 | 2,424 | 2,094 | 1,264 | 1,540 |
| 1979 | 1,940 | 2,217 | 1,036 | 1,294 |
| 1980 | 2,006 | 2,469 | 1,037 | 1,295 |
| 1981 | 2,128 | 2,328 | 1,037 | 1,295 |
| 1982 | 2,264 | 2,518 | 1,038 | 1,296 |
| 1983 | 2,317 | 2,311 | 1,039 | 1,297 |
| 1984 | 2,069 | 2,418 | 1,040 | 1,297 |
| 1985 | 2,128 | 2,545 | 1,040 | 1,298 |
| 1986 | 2,207 | 2,671 | 1,041 | 1,298 |

---

SOURCES: East Central Area Reliability Council(ECAR), Load Projections and Resource Planning, (April 1977) Exhibit I-C p. 42

Mid-America Interpool Network (MAIN), Reply to Appendix A-1 of Order No. 383-4, (April, 1977) Item 2-C p. 2-49

In contrast, the projections indicate that ECAR, as a whole, will export approximately twice as much power as it will import over the same reporting period (Table 5). Planned exports will exceed planned imports in all summers and winters through 1986.

## Power Resources: Peak and Margin

Through capacity exchanges and other load sharing mechanisms, the utilities try to keep up with the demand for power. The demand is cyclical, increasing at certain times of the day or year. All utilities experience increased demand (i.e. peaks) during the day and evening, diminishing at night. The yearly peak is not as predictable. Most utilities in the six-state region are summer peaking, while others are winter peaking (Table 6). In the next ten years, utilities in the ECAR region are expected to experience only slightly more demand in the summer than in the winter. On the other hand, MAIN utilities are expected to experience a definite summer peaking schedule. The timing of peak demand is an important consideration in load management and planning since staggered peaks can reduce the overall capacity needed to maintain reliable power.

The difference between the system capacity and the peak load is the "margin of capability" or "reserve margin." This is essentially the power available to provide for scheduled maintenance, emergency outages, system operating requirements, and unforeseen loads. The reserve margins for utilities in the ORBES states ranged from 44.8 percent to -24.0 percent in 1976 and from 38.7 to -17.0 in 1977. The higher margins generally belong to the largest utilities, those with the greatest amount of generating capacity. The negative reserve margins are generally associated with the smaller utilities, which may find it more economical to purchase power than to construct new

# TABLE 6

## PEAK LOADS AND RESERVE MARGINS: 1976-1977

| STATE | COMPANY** | 1976 |  |  |  |  | 1977 |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | Generating Capacity (MWe) | Peak Load (MWe) | Date of Peak Load | Reserve Margin at Peak |  | Generating Capacity (MWe) | Peak Load (MWe) | Date of Peak Load | Reserve Margin at Peak |  |
|  |  |  |  |  | MWe | % |  |  |  | MWe | % |
| IL | CEIL | 1,397 | 965 | Summer | 432 | 44.8 | 1,244 | 975 | 7/14 | 269 | 27.6 |
|  | CEIP | 1,809 | 1,665 | --- | 144 | 8.6 | 1,819 | 1,813 | July | 6 | 0.3 |
|  | COEC | 15,909 | 12,907 | --- | 3,002 | 23.3 | 16,409 | 13,932 | 7/15 | 2,477 | 17.7 |
|  | ILPC | 3,412 | 2,570 | --- | 842 | 32.8 | 3,412 | 2,846 | 7/15 | 566 | 19.9 |
|  | IOIG | 1,166 | 811 | Summer | 355 | 43.8 | 1,104 | 872 | --- | 232 | 26.6 |
|  | UNEC | 6,361 | 5,582 | 7/26 | 779 | 14.0 | 6,673 | 5,837 | 7/15 | 836 | 14.3 |
| IN | INPL | 2,013 | 1,671 | 7/23 | 342 | 20.5 | 2,013 | 1,802 | 7/15 | 211 | 11.7 |
|  | NOIP | 1,855 | 1,997 | 7/27 | -142 | - 7.1 | 2,286 | 2,213 | 7/15 | 73 | 3.3 |
|  | PSIN | 4,378 | 3,138 | 11/29 | 1,240 | 39.5 | 4,378 | 3,388 | December | 990 | 29.2 |
|  | SOIG | 750 | 593 | 7/23 | 157 | 26.5 | 750 | 669 | 7/18 | 81 | 12.1 |
| KY | KEUC | 1,706 | 1,641 | 12/21 | 65 | 4.0 | 2,228 | 1,797 | 1/18 | 431 | 24.0 |
|  | LOGE | 2,162 | 1,583 | --- | 579 | 36.6 | 2,137 | 1,705 | 7/15 | 432 | 25.3 |
| OH | CIGE | 3,424 | 2,598 | 7/15 | 826 | 31.8 | 3,308 | 2,841 | 7/20 | 467 | 16.4 |
|  | CLEI | 3,906 | 3,065 | --- | 841 | 27.4 | 3,631 | 3,350 | July | 281 | 8.4 |
|  | COSO | 2,111 | 1,776 | Summer | 335 | 18.9 | 2,480 | 1,932 | 7/20 | 548 | 28.4 |
|  | DAPO | 2,361 | 1,793 | --- | 568 | 31.7 | 2,361 | 1,954 | 7/20 | 407 | 20.8 |
|  | OHEC | --- | --- | --- | --- | --- | 4,961 | 4,134 | 7/01 | 827 | 20.0 |
|  | TOEC | --- | --- | --- | --- | --- | 1,665 | 1,393 | 7/15 | 272 | 19.5 |
| PA | DULC | 2,964 | 2,260 | --- | 704 | 31.2 | 3,289 | 2,371 | 7/21 | 918 | 38.7 |
|  | MEEC | 1,811* | 1,410 | --- | 401 | 28.3 | 1,698 | 1,428 | Winter | 270 | 18.9 |
|  | PEEC | 2,172* | 1,994 | --- | 178 | 8.9 | 2,358 | 2,022 | January | 336 | 16.6 |
|  | PEPC | 400 | 526 | 12/21 | -126 | -24.0 | 456 | 551 | 7/18 | -95 | -17.0 |
|  | PEPL | 5,717 | 4,425 | Winter | 1,292 | 29.2 | 5,726 | 4,431 | Winter | 1,295 | 29.2 |
|  | PHEC | 7,742 | 5,346 | --- | 2,396 | 44.8 | 8,198 | 5,888 | 7/21 | 2,310 | 39.2 |
| WV | POEC | 5,013 | 3,500 | --- | 1,513 | 43.2 | --- | --- | --- | --- | --- |
|  | AEPS | 17,661 | 13,539 | Winter | 3,699 | 27.3 | --- | 12,611 | Winter | 3,950 | 31.3 |
|  | APSI | 6,429 | 4,650 | 1/22 | 1,779 | 38.3 | 6,429 | 5,031 | 1/17 | 1,294 | 27.8 |

*Includes firm purchases

**See Glossary, Appendix A, for company abbreviations

SOURCE: Annual Report 1976 and 1977 for each company shown generating facilities. Each utility or power pool is responsible for maintaining the margins suggested by the regional reliability council. In general, it is recommended that a utility maintain reserves equivalent of 15%-20% of the total peak demand or 50% of the capability of the largest generating unit, whichever is greater.

# CHAPTER VI

# ELECTRIC GENERATING CAPACITY: 1976-1985

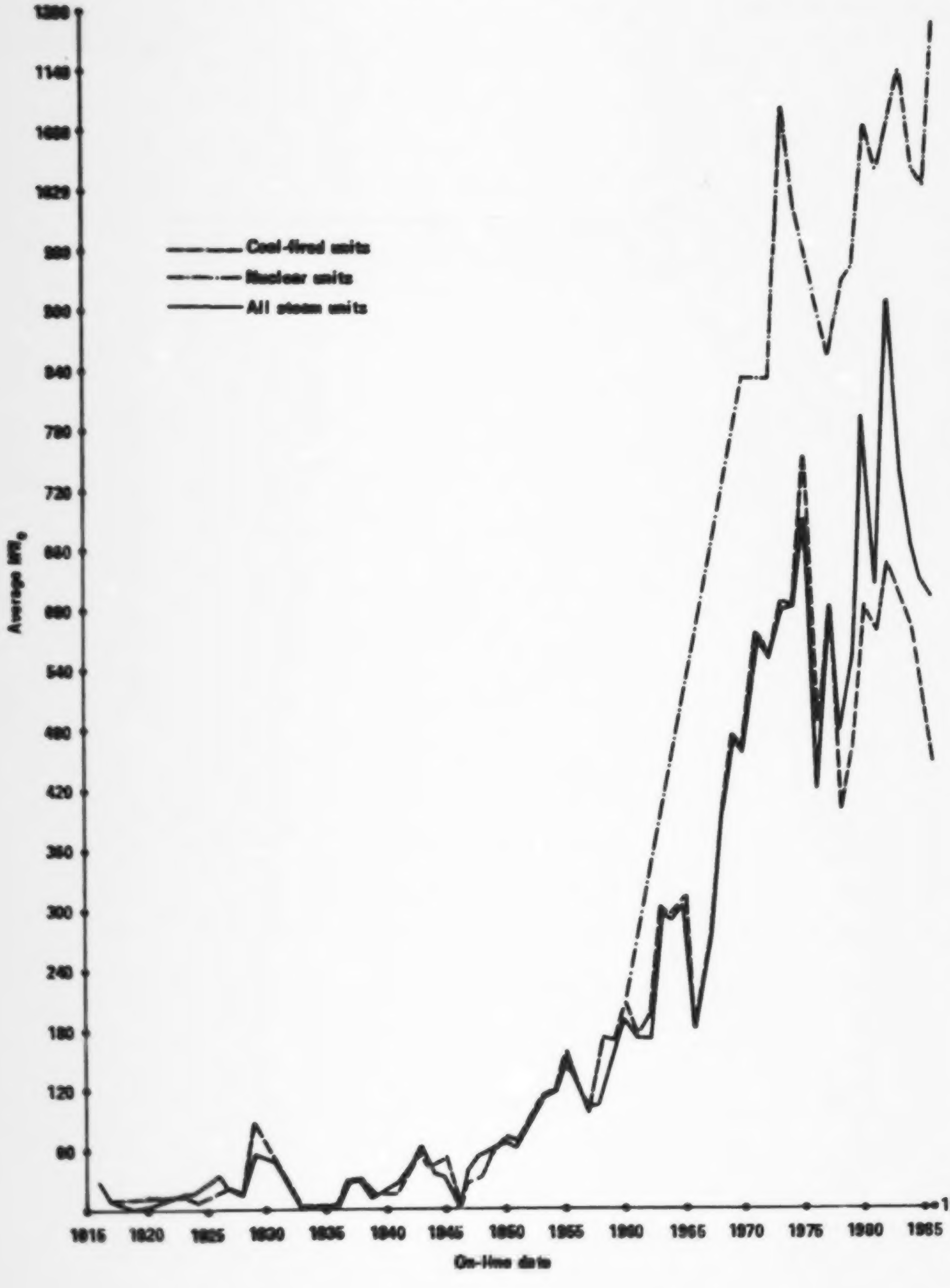
To maintain a reliable level of generating capacity, utilities constantly plan for the future. To do this, they must formulate long range forecasts of expected demand and adjust capacity to meet these demands. Basically this involves projecting load growth ten or more years into the future. The required capacity additions must account for the projected load, capacity retirements, and an adequate reserve margin. The utility must then consider the trade-offs between purchasing increasing amounts of electricity or constructing a new facility. If the latter is chosen, options regarding the fuel sources and the location of the new plant must be assessed.

## Growth in Generating Unit Size

Current plans indicate that the new units will primarily be fueled by coal or uranium. Nuclear power, expected to replace petroleum as the second largest fuel source for the installed capacity in the six-state region by 1985, will experience a greater relative increase than the coal-fired capacity. However, in absolute terms, coal should remain the major source of fuel in all six states.

The average size of new electric generating units increased rapidly between 1960 and 1975 (Figure 12). This was due, in part, to the introduction of nuclear units which tended to be large and, in part, to the increasing size of new coal units to realize economies of scale. In 1960, the average size of coal capacity

Figure 12. Average MWe Size of Generating Units in the Six ORBES States
By On-Line Date*



SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory. Prepared for the Ohio River Basin Energy Study, (November, 1978).

*Future figures are based on announced utility plans additions was 190 MWe and the maximum was about 600 MWe. By 1975, the average new coal-fired unit had increased to 750 MWe and the maximum size was 1300 MWe. It now appears that at least for the near future, utilities have reached the limit of increasing economy of scale with larger coal-fired units. Over 60 percent of scheduled coal-fired additions between 1976 and 1985 are in the range of 400 to 650 MWe.

Nuclear units have shown a much more stable size distribution history. With the exception of the first prototype reactors at Shippingport, Pennsylvania and Dresden Unit 1 in Illinois, which was the first privately financed reactor in the United States, all of the reactors in the ORBES six-state region have been built or are planned through 1985 in the size range between 684 MWe and 1205 MWe. Table 7 illustrates some elements of this growth; new coal units will be, on the average, more than twice as large as existing coal units. New nuclear units are expected to be about 20 percent larger than those now in operation. Furthermore, the average nuclear unit additions are expected to be almost twice the size of coal-fired unit additions. This size differential is reflected in Figure 12, which shows the growth in the average size of generating unit additions as a function of on-line date in the six-state region.

As a result of the significant increases in the generating unit size, the number of on-line units is expected to decline between 1976 and 1985 (Table 8) while the total installed capacity will continue to increase. The new plants will allow utilities to retire the older, smaller, less efficient and consequently, less economical generating unit. These retirements will primarily affect coal and oil burning plants; no commercial sized nuclear plants are scheduled for retirement before 1985.

## TABLE 7

## UNIT SIZE, MWe

ORBES Six-State Region
(steam units only)

| | OPERATING UNITS 1975 | | NEW UNITS 1976-1985 | |
|---|---|---|---|---|
| | COAL | NUCLEAR | COAL | NUCLEAR |
| Mean | 190 | 862 | 549 | 1,023[a] |
| Maximum | 1,300 | 1,098 | 1,300 | 1,205 |
| Minimum | 1 | 209 | 20 | 60[b] |

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory. Prepared for the Ohio River Basin Energy Study (November, 1978).

[a] Mean size calculated excluding experimental Shippingport Light Water Breeder Reactor.

[b] Shippingport experimental Light Water Breeder Reactor.

## TABLE 8

## NEW UNITS AND EXISTING UNITS

ORBES Six-State Region
(steam units only)

| | COAL | OIL | NUCLEAR | OTHER |
|---|---|---|---|---|
| Total Units, 1975 | 456 | 102 | 10 | 44 |
| New Units, 1976-1985* | 67 | 8 | 25 | 2 |
| Retired Units, 1976-1985* | -114 | -70 | 0 | -35 |
| Total Units, 1985* | 409 | 40 | 35 | 11 |

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study, (November, 1978).

*Based on announced utility plans.

## Proposed Capacity Additions 1976-1985

As indicated earlier, nearly all new generating units planned by the electrical utilities will utilize either coal or nuclear fuel. Sixty percent of the coal-fired unit additions and 96 percent of the nuclear-powered unit additions are scheduled to be constructed on new sites, while the remainder will be built on sites which already support some generating capacity (Table 9). In terms of total megawattage, the new coal-fired sites will be 2.5 times larger than existing coal sites. The size of nuclear-powered sites, however, is not expected to change significantly (Table 10).

Nearly half of the 67,714 MWe capacity additions scheduled by the utilities for the 1976-1985 period, are expected to be in Illinois and Pennsylvania (Table 11). This is primarily due to the large increases in nuclear capacity slated for these states. However, coal-fired units account for all of the total scheduled capacity additions in Kentucky and West Virginia, and three-quarters of the total in Indiana. The majority of all these scheduled additions are along the Ohio River and its tributaries (Figure 13).

In the six-state region, 58 percent of the scheduled coal-fired capacity additions are sited along the Ohio River main stem (Figure 14). Three states in particular, West Virginia, Kentucky and Ohio, have the majority of their new coal capacity along this river. Another 30 percent of the coal-fired capacity will be located on tributaries of the Ohio River. Nearly half of Indiana's new capacity will be on these tributaries, especially the Wabash and White rivers.

Nuclear-powered units comprise a large percentage of the total scheduled capacity additions in Illinois, Ohio and Pennsylvania. Eighty percent of the total 24,619 MWe of new nuclear capacity are scheduled to be located outside of the Ohio River drainage basin (Figure 15). Although Indiana and Ohio have scheduled nuclear capacity additions for the first time, the majority of the nuclear

## TABLE 9

## NEW SITES vs. EXISTING SITE EXPANSION

ORBES Six-state Region
(steam sites only)

| | COAL | OIL | NUCLEAR | OTHER[a] |
|---|---|---|---|---|
| Total Sites, 1975[b] | 159 | 41 | 5 | 34 |
| New Sites, 1976-1985 | 15 | 2 | 15[c] | 4 |
| Retired Sites, 1976-1985 | -18 | -11 | 0 | -23 |
| Total Sites, 1985 | 156 | 32 | 20 | 15 |
| 1976-1985 Capacity Added to: | COAL | OIL | NUCLEAR | OTHER[a] |
| Existing Sites, MWe | 11,969 | 1,540 | 927[c] | - |
| New Sites, MWe | 22,934 | 2,535 | 23,692[c] | 90 |
| Unsited, MWe | 2,940 | - | - | 690 |

SOURCE: Steven D. Jansen, Electric Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November 1978).

[a] Includes gas, multi-fueled, refuse, undetermined and unknown fuel types.

[b] Same site may be counted more than once under different fuel types except for nuclear.

[c] Bailey nuclear facility is considered a new site although presently there is coal and oil capacity at the site.

## TABLE 10

## SITE SIZE, MWe

ORBES Six-state Region
(steam sites only)

| | OPERATING SITES 1975 | | NEW SITES 1976-1985 | |
|---|---|---|---|---|
| | COAL | NUCLEAR | COAL | NUCLEAR |
| Mean | 546 | 1,724 | 1,349 | 1,688[a] |
| Maximum | 2,932 | 2,196 | 2,751 | 2,410 |
| Minimum | 2 | 818 | 480 | 810 |

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study. (November, 1978).

[a] Mean site size calculated excluding 60 MWe Shippingport experimental Light Water Breeder Reactor.

## TABLE 11

## CAPACITY ADDITIONS

## 1976-1985

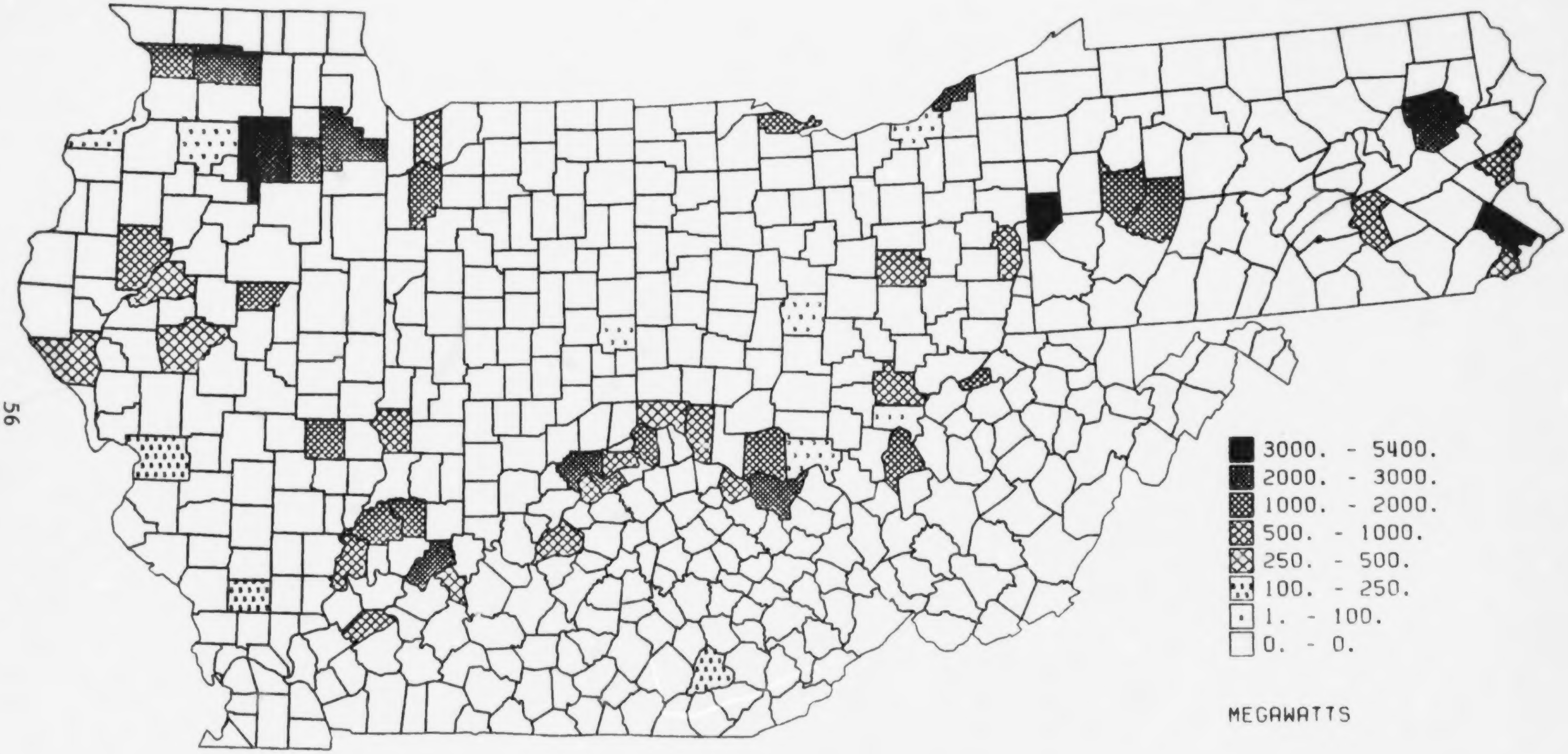
| State | Capacity Additions[1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | | Coal | | Nuclear | | Other[2] | |
| | MWe | % Total | MWe | % Coal | MWe | Nuclear | MWe | % Other |
| Illinois | 18,558 | 27.4 | 4,989 | 13.4 | 9,656 | 39.2 | 3,913 | 67.0 |
| Indiana | 12,061 | 17.8 | 8,951 | 24.0 | 2,944 | 12.0 | 166 | 2.8 |
| Kentucky | 11,061 | 16.2 | 10,680 | 28.7 | - | - | 322 | 5.5 |
| Ohio | 9,190 | 13.6 | 3,952 | 10.6 | 5,032 | 20.4 | 206 | 3.5 |
| Pennsylvania | 14,351 | 21.2 | 6,134 | 16.5 | 6,987 | 28.4 | 1,230 | 21.2 |
| West Virginia | 2,552 | 3.8 | 2,552 | 6.8 | - | - | - | - |
| Total | 67,714 | 100.0 | 37,258 | 100.0 | 24,619 | 100.0 | 5,837 | 100.0 |

SOURCE: Steven D. Jansen, Electric Generating Unit Inventory, prepared for the Ohio River Basin Energy Study, (November, 1978)

[1] Does not include MWe reductions due to unit retirements

[2] Includes oil, natural gas, hydropower, and other miscellaneous fuels

Fig. 13 Total Proposed Generating Capacity Additions: 1976-1985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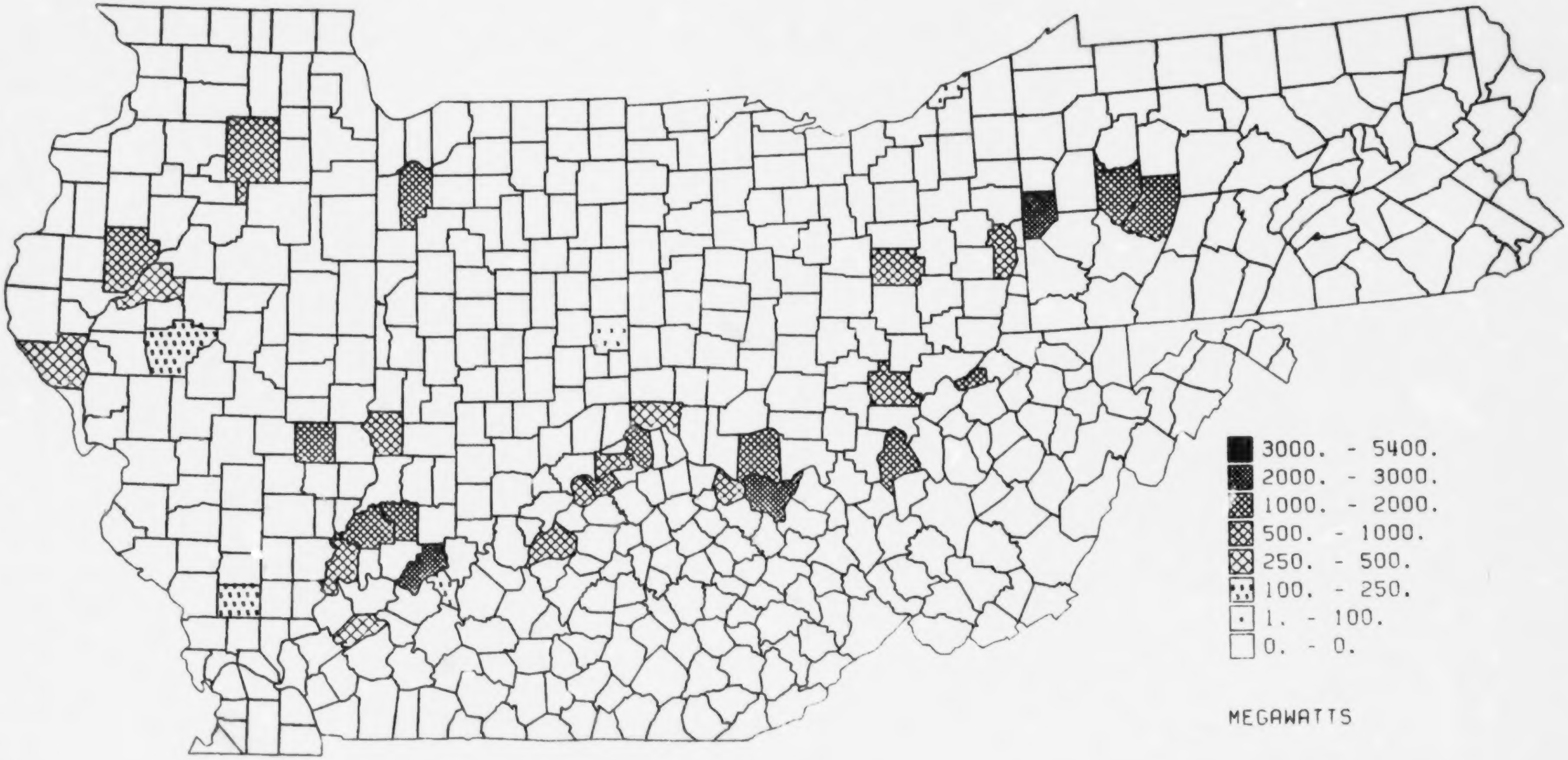
1. - 100.
0. - 0.
MEGAWATTS

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

Fig. 14 Total Proposed Coal-Fired Generating Capacity Additions
1976-1985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250. - 500.
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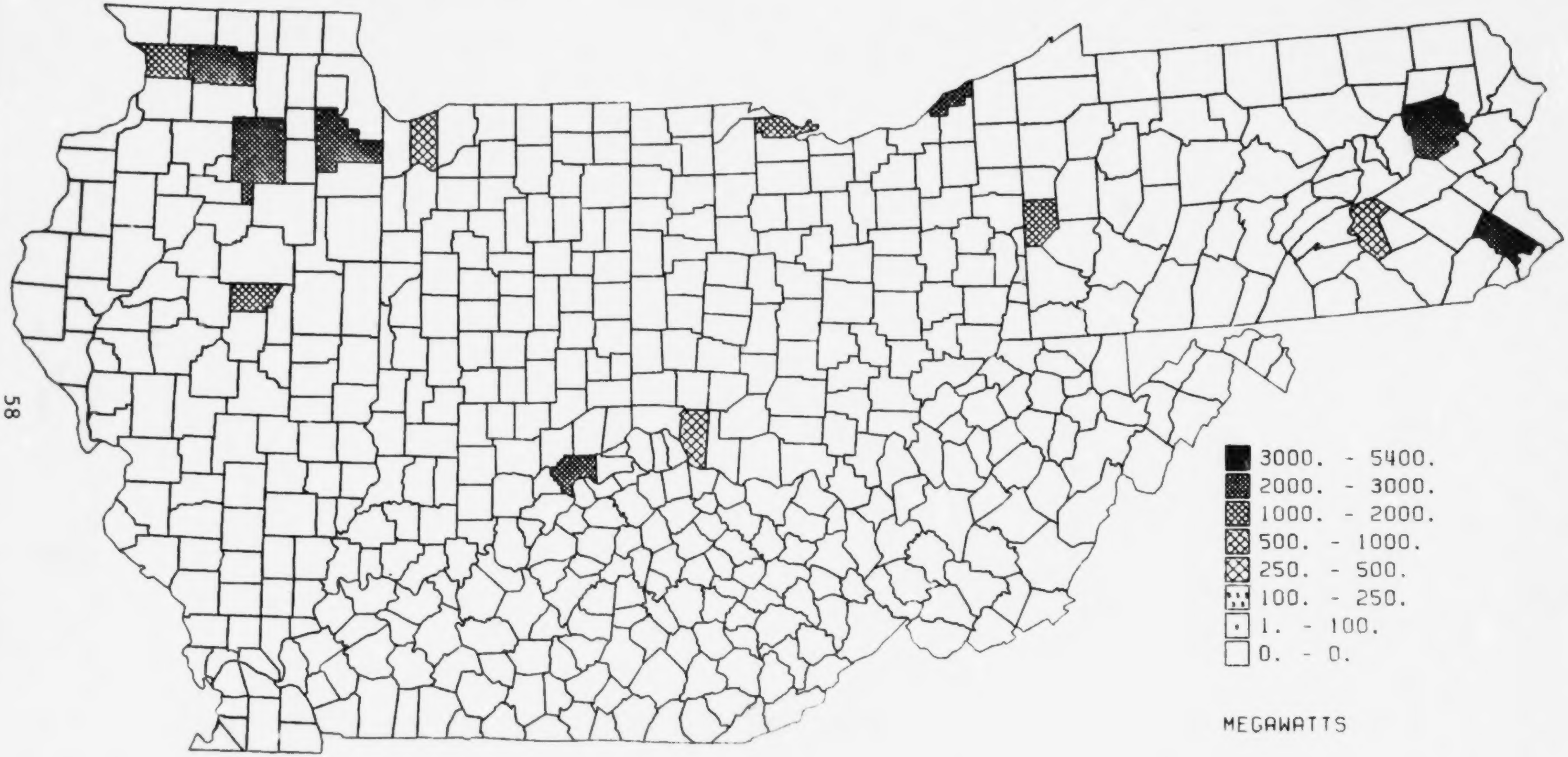
1. - 100.
0. - 0.
MEGAWATTS

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

Fig. 15  Total Proposed Nuclear Generating Capacity Additions: 1976-1985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500. - 1000.
250. - 500.
100. - 250.
1. - 100.
0. - 0.
MEGAWATTS

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

expansion is in parts of the region which had nuclear capacity in 1975. In general, nuclear plants are located away from major coal producing areas. Neither Kentucky nor West Virginia have scheduled nuclear-powered electric generating units through 1985.

## Total Capacity - 1985

By 1985, 61 percent of the total coal and nuclear powered generating capacity is expected to be located in Illinois, Pennsylvania and Ohio (Table 12). The most significant growth is projected to be along the Ohio River main stem, where the concentration of generating capacity would increase to 34.5 percent of the six-state total and along the Ohio's tributaries where the capacity would increase to 26.5 percent of the total. This is primarily due to new coal-fired capacity additions being located in these areas (Figure 16).

Ohio, Indiana and Pennsylvania are expected to contain 54 percent of the total 118,572 MWe of coal-fired generating capacity (Figure 17). Almost three-quarters will be in the Ohio River drainage basin, with 40 percent located on the main stem, (as compared to 32 percent located there in 1975) and 34 percent on the tributaries. This projected growth would significantly increase the concentration of electric generating capacity along the main stem of the Ohio River between Portsmouth, Ohio and Louisville, Kentucky.

Most of the nuclear electric generating capacity projected for 1985 will be located in Illinois and Pennsylvania. These two states are expected to have 76% of the total 33,240 MWe nuclear capacity. Only three sites (Zimmer in Ohio, Marble Hill in Indiana, and Beaver Valley in Pennsylvania) will be along the Ohio River main stem. These three sites would constitute 15 percent of the total nuclear

## TABLE 12

## ELECTRICAL GENERATING CAPACITY - 1985

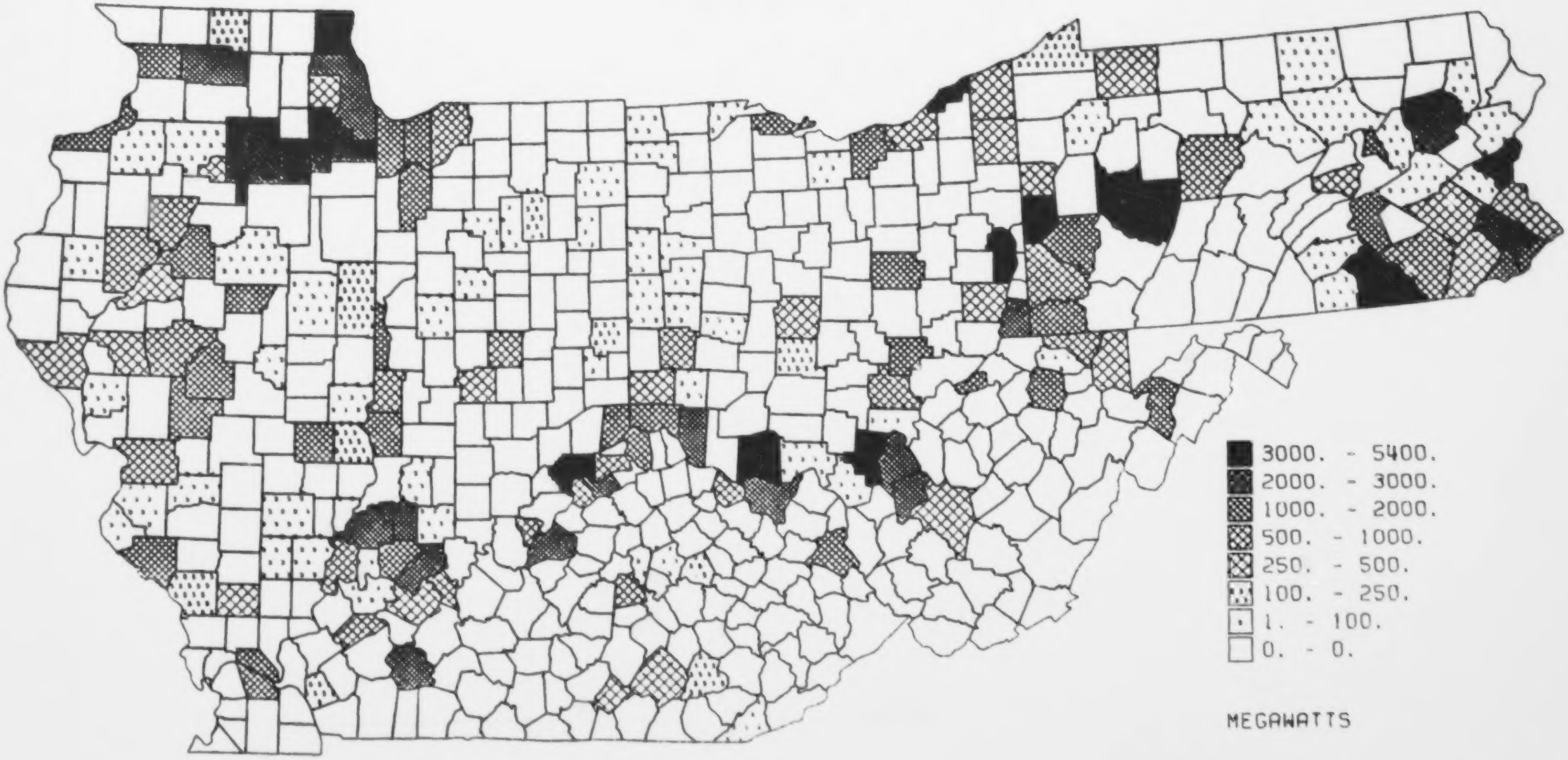
## SIX-STATE REGION

| | Coal | Nuclear | Other[1] | Total |
|---|---|---|---|---|
| Illinois | 19,742 | 15,373 | 7,206 | 42,321 |
| Indiana | 20,881 | 2,944 | 925 | 24,750 |
| Kentucky | 20,791 | - | 1,575 | 22,366 |
| Ohio | 22,379 | 5,032 | 1,981 | 29,392 |
| Pennsylvania | 20,843 | 9,891 | 9,039 | 39,773 |
| West Virginia | 13,936 | - | 347 | 14,283 |
| Total 1985 Capacity-MWe | 118,572 | 33,240 | 21,073 | 172,885 |

SOURCES: Steven D. Jansen, Electrical Generating Unit Inventory, prepared for the Ohio River Basin Energy Study (November 1978).

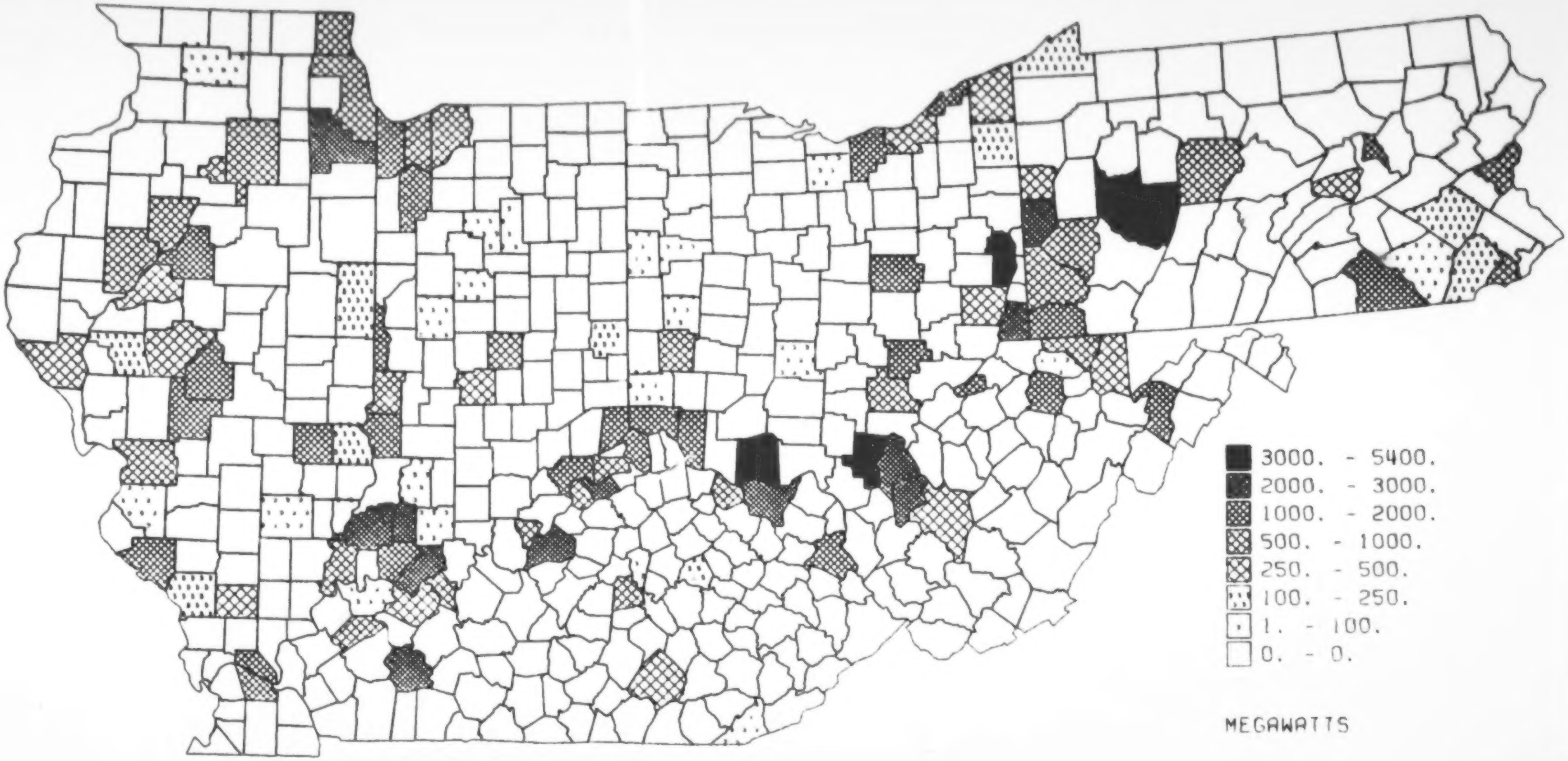
[1] Other includes petroleum, natural gas, hydropower, multifueled, refuse, undetermined and unknown fuel types.

Fig. 16 Total Generating Capacity: 1985


3000. - 5400.
2000. - 3000.
1000. - 2000.
500. - 1000.
250. - 500.
100. - 250.
1. - 100.
0. - 0.
MEGAWATTS

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

Fig. 17 Total Coal-Fired Generating Capacity: 1985


3000. - 5400.
2000. - 3000.
1000. - 2000.
500. - 1000.
250. - 500.
100. - 250.
1. - 100.
0. - 0.
MEGAWATTS

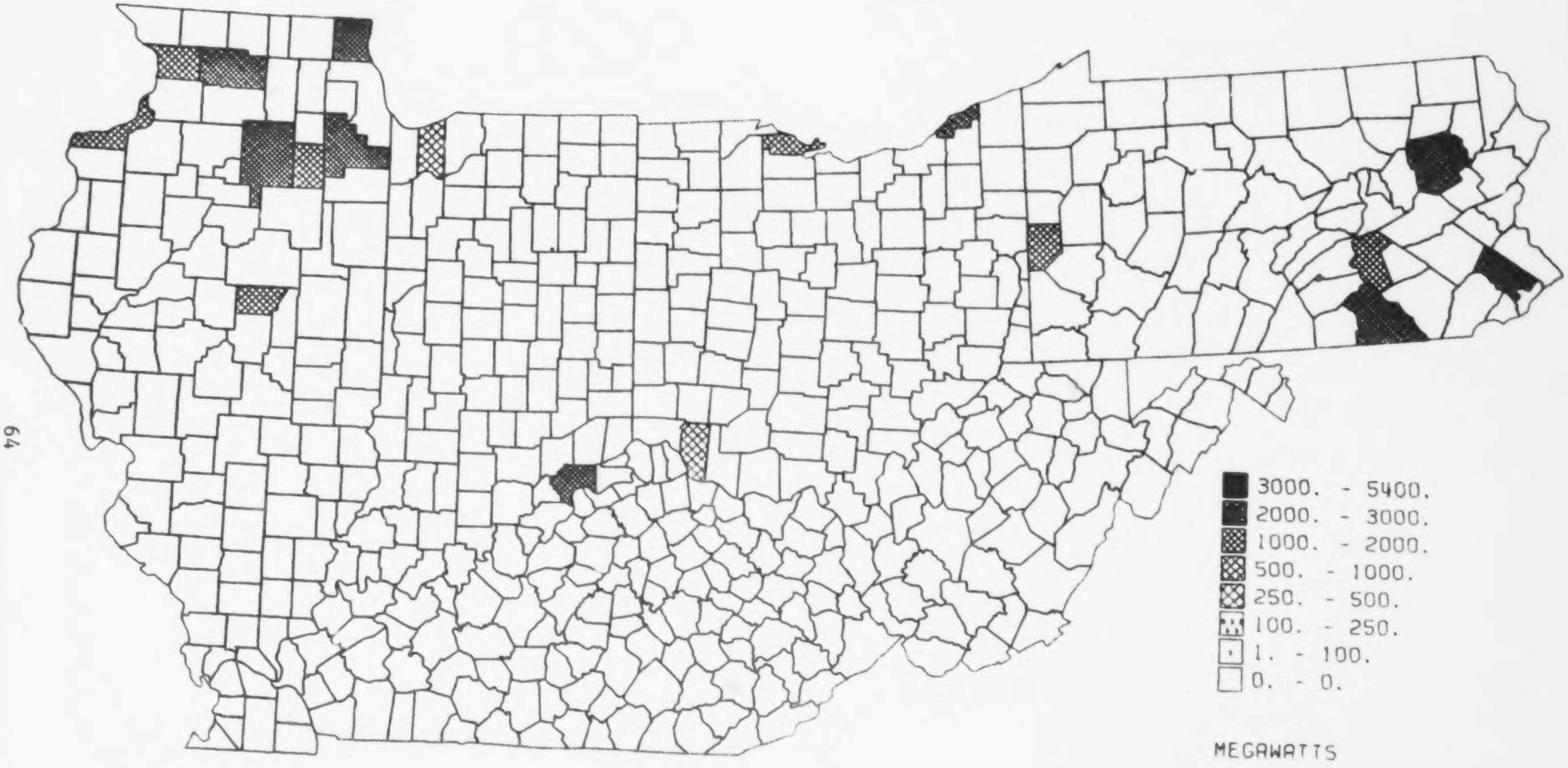
SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study, (November, 1978) capacity. The remainder is expected to be located outside of the Ohio River drainage basin (Figure 18).

These announced plans are constantly revised by the utilities. Since 1976, numerous changes have occurred in the capacity additions scheduled through 1985 (Figure 19).[1] The net effect of these changes over a one year period was to reduce the expected 1985 installed capacity by 1,926 MWe. While the MWe of postponed coal units was approximately equal to the megawattage of newly-announced plants, the expected nuclear capacity had a net reduction of 2,158 MWe because postponements were not compensated for by newly announced units. The changes in scheduled capacity additions in the six-state region follow the general national slowdown in new power plant construction. Additional regulatory and public acceptability uncertainties resulting from the Three Mile Island accident have placed a disproportional amount of this slowdown on the nuclear industry.

---

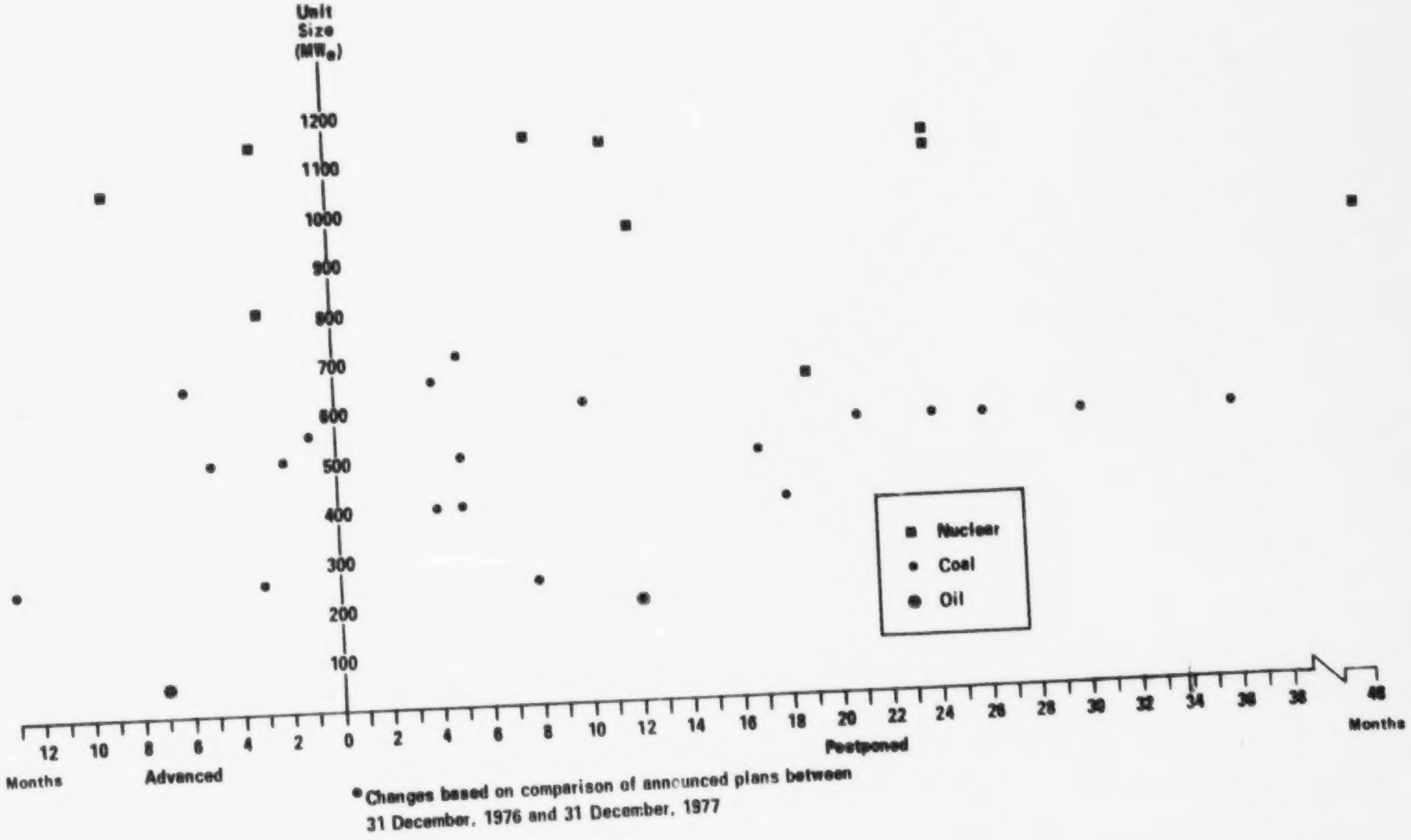
[1] Changes (including postponements, cancellations, deratings, aratings, and additions) are calculated by comparing the Electrical Generating Unit Inventory for 1976 with an unpublished undate for 1977.

Fig. 18 Total Nuclear Generating Capacity: 1985


3000. - 5400.
2000. - 3000.
1000. - 2000.
500. - 1000.
250. - 500.
100. - 250.
1. - 100.
0. - 0.
MEGAWATTS

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

Fig. 19 Changes in Scheduled On-Line Dates for Electrical Generating Units in the Six ORBES States



*Changes based on comparison of announced plans between 31 December, 1976 and 31 December, 1977

SOURCE: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978) and an unpublished 1977 update

## CHAPTER VII

## COMPARATIVE FINANCIAL AND OPERATING STATISTICS FOR INVESTOR-OWNED UTILITIES

The investor-owned utilities in the ORBES states vary widely in the size and scope of their operations. These variations, summarized in Table 13, illustrate the very significant differences which exist among the utilities with respect to service areas, number of customers, annual sales and total generation.

### Residential Customer Statistics

Residential customer statistics are a convenient means of comparing utilities throughout the ORBES states. These can be used as indicators to identify differences in residential costs and usage throughout the ORBES states. The average rate per Kwh for residential customers, which includes such costs as rate base, transmission costs, and fixed service charges, shows the differences in electric costs across the six-state region. In the ORBES states, residential users make up the majority of the investor-owned utility's customers. If the rates charged by each single system utility are averaged for each state, Kentucky appears to have the lowest rate, averaging 2.71 cents/Kwh, while Pennsylvania has the highest--4.30 cents/Kwh. Charges to customers of the two large holding companies fall within this range: AEPS customers average 2.96 cents/Kwh while APSI customers pay an average of 3.45 cents/Kwh. Average

# TABLE 13
# CHARACTERISTICS OF THE MAJOR INVESTOR-OWNED UTILITIES IN THE SIX ORBES STATES
## SUMMARY TABLE[1]

| State | Utility Code[2] | Service Area (sq. miles) | Population Served (Thousands) | Operating Statistics |  |  |  | Residential Customer Statistics |  | Regulating Agency[4] |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Customers[3] (Thousands) | Sales[3] ($10^3$ Mwh) | Revenues[3] ($10^3$ dollars) | Generation[3] ($10^3$ Mwh) | Ave.rate/Kwh (cents) | Ave. cust. use Kwh/yr |  |
|  | APSI | - | - | 1,039 | 29,461 | 725,274 | 29,461 | 3.45 | 8,197 |  |
| OH,WVA,VA,MD | MOPC | 11,900 | 678 | 280 | 7,627 | 216,645 | 7,628 | 3.90 | 6,713 | PUCO, SEC, WVPSC, VSCC, MPSC |
| MD,VA,WVA | POEC | 7,266 | 563 | 261 | 8,815 | 297,582 | 9,508 | 3.40 | 10,383 | PSCM, SEC, VSCC, WVPSC |
| PA | WEPP | 9,900 | 1,386 | 495 | 13,034 | 316,905 | 13,034 | 3.27 | 7,887 | PPUC |
|  | AEPS | - | 6,196 | 1,918 | 84,913 | 1,817,309 | 91,329 | - | - | SEC |
| TN,VA,WVA,PA | APPC | 19,260 | 2,153 | 673 | 26,037 | 610,184 | 28,322 | 3.09 | 9,893 | TPSC, SEC, VSCC, WVPSC, PPUC |
| IN,MI | INME | 7,740 | 1,599 | 427 | 20,047 | 417,548 | 21,337 | 2.76 | 10,43[illegible] | IPSC, MPSC, SEC |
| KY | KEPC | 5,700 | 396 | 128 | 4,159 | 84,240 | 4,309 | 2.45 | 10,112 | KPSC, SEC |
| OH | OHPC | 7.374 | 1.698 | 587 | 14.956 | 712.747 | 37.098 | 3.11 | 9,187 | PUCO, SEC |
|  | GPU | 23.530 | 4,076 | 1,483 | 28,637 | 1,066,176 | 31,702 | - | - |  |
| PA | MEEC | 3,274 | 827 | 337 | 7,089 | 263,503 | 7,294 | 4.47 | 7,633 | PPUC, SEC |
| PA | PEEC | 17,600 | 1,500 | 488 | 10,059 | 337,918 | 10,165 | 4.01 | 6,565 | PPUC, SEC |
| IL | CEIL | 3,700 | 439 | 172 | 4,223 | 144,727 | 4,542 | 4.16 | 8,259 | ICC |
| IL | CEIP | 20,000 | 760 | 292 | 7,760 | 242,128 | 8,429 | 4.00 | 7,859 | ICC |
| IL | COEC | 11,525 | 8,000 | 2,791 | 58,337 | 1.908,188 | 63,274 | 4.03 | 6,331 | ICC |
| IL | ILPC | 15,000 | 1,360 | 489 | 12,076 | 303,066 | 12,076 | 3.33 | 7,609 | ICC |
| IL,IA | IOIG | - | 596 | 159 | 3,439 | 99,974 | - | 3.99 | 6,170 | ICC, ISCC |
| IL,IA,MO | UNEC | 24,000 | 2,710 | 924 | 21,359 | 635,000 | 23,305 | 3.76 | 8,114 | ICC, ISCC, MoPSC |
| IN | INPL | 528 | 850 | 309 | 7,906 | 184,055 | 8,406 | 2.62 | 8,643 | IPSC |
| IN | NOIP | 12,000 | 2,124 | 345 | 12,572 | 323,382 | 8,660 | 3.77 | 6,855 | IPSC |
| IN | PSIN | - | - | 498 | 15,532 | 397,742 | 16,858 | 3.43 | 9,497 | IPSC |
| IN | SOIG | 2,250 | 282 | 93 | 3,457 | 75,874 | 3,611 | 3.37 | 8,771 | IPSC |
| KY | KEUC | 10,000 | 850 | 331 | 10,810 | 229,356 | 10,810 | - | 8,806 | KPSC |
| KY | LOGE | 700 | 805 | 283 | 7,582 | 154,327 | 7,974 | 2.59 | 7,890 | KPSC |
| OH | CIGE | 3,000 | 1,700 | 463 | 12,429 | 352,419 | 13,436 | 3.24 | 8,251 | KPSC, PUCO |
| OH | CLEI | 1,700 | 2,122 | 693 | 18,070 | 532,200 | 18,331 | 3.97 | 6,187 | PUCO |
| OH | COSO | 6,200 | 1,290 | 431 | 8,133 | 280,285 | 8,133 | 4.17 | 7,362 | PUCO |
| OH | DAPO | 6,000 | 1,300 | 403 | 9,221 | 273,671 | 10,065 | 3.50 | 8,989 | PUCO |
| OH | OHEC | 7,500 | 2,380 | 796 | 18,167 | 556,266 | 20,201 | 3.90 | 7,361 | PUCO, SEC |
| OH | PEPC | 1,500 | 324 | 116 | 3,035 | 88,586 | 3,254 | 4.08 | 7,301 | PPUC, SEC |
| OH | TOEC | 2,250 | 750 | 254 | 7,222 | 219,129 | 7,814 | 4.02 | 7,903 | PUCO |
| PA | DULC | 800 | 1,600 | 535 | 12,516 | 418,268 | 12,516 | 4.73 | 5,581 | PPUC |
| PA | PEPL | 10,000 | 2,400 | 926 | 20,354 | 631,427 | 20,354 | 3.10 | 8,931 | PPUC |
| PA | PHEC | 2,475 | 3,900 | 1,261 | 26,273 | 1,024,800 | 28,437 | 4.92 | 6,710 | PPUC, SEC |

[1] Detailed data available in Appendix E.

[2] See glossary, Appendix A, for utility abbreviations.

[3] Numbers rounded to nearest thousand.

[4] All utilities identified in this table are under the jurisdiction of the Federal Energy Regulatory Commission as well as the regulatory agencies shown.

SOURCE: Moody's Public Utility Manual, 1976.

annual residential usage also varies among the utilities, ranging from 6,659 Kwh/residential customer in Illinois to 8,450 Kwh/residential customer in Indiana.[1] Use by AEPS customers was higher, averaging 9,735 Kwh/residential customer. APSI users averaged 8,197 Kwh/residential customer. These figures, however, do not indicate the extent to which electricity is used for home heating. Data such as the availability of oil and natural gas for heating purposes and the number of degree days in the region are needed for further interpretation.

Despite the fact that the residential segment represents the largest number of customers, megawatt-hour sales to commercial and industrial firms are substantially larger throughout the six-state region. This is primarily a result of the concentration of heavy industry in the six-ORBES states. However, no statistics comparable to the residential customer statistics are available.

## Utility Performance Statistics

Between 1971 and 1976, the percent of revenues devoted to fuel cost increased between 50 percent and 100 percent in most utilities reporting the statistic. This general rise in fuel costs was accompanied by a general decrease, on the order of 10-40 percent, in the percent of revenues going for labor. Clearly, fuel costs have risen more dramatically than labor costs (Table 14).

The heat rate is a measure of overall thermal efficiency; thus a lower figure indicates greater efficiency in burning fuels. The rates reported by utilities in the ORBES states have fluctuated, creating no clear trend over the six years. Factors such as average unit efficiency, plant age, and

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[1] The Illinois figure is calculated from statistics for the four major utilities in the state: Central Illinois Light Co., Central Illinois Public Service Co., Commonwealth Eidson Co., and Illinois Power Company. Data for Iowa-Illinois Gas and Electric and Union Electric Company are not included.

# TABLE 14
# SELECTED FINANCIAL STATISTICS OF THE MAJOR INVESTOR-OWNED UTILITIES IN THE SIX ORBES STATES
## SUMMARY TABLE

| Utility code | % net oper. revenue to net utility plant | Percent of Revenues | | | | Heat Rate (Btu/Kwh) | | Fuel | | | | Employees per $ 1 Million Revenue | | 1976 Standard & Poor Rating |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | For Fuel | | For Labor | | | | Ave. Cost/ton | | Ave.Cost/$10^6$Btu | | | | |
| | | 1971 | 1976 | 1971 | 1976 | 1971 | 1976 | 1971 | 1976 | 1971 | 1976 | 1971 | 1976 | |
| APSI | - | - | - | - | - | 10,511 | 9,808 | - | - | $ 0.28 | $ 0.97 | - | - | - |
| MOPC | 9.5 | - | - | - | - | - | - | - | - | - | - | - | - | A- |
| POEC | 8.3 | - | - | - | - | - | - | - | - | - | - | - | - | A |
| WEPP | 7.5 | - | - | - | - | - | - | - | - | - | - | - | - | AA |
| AEPS | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| APPC | 8.8 | - | - | - | - | 9.220 | 9,489 | - | - | - | - | - | - | BBB- |
| INME | 6.3 | - | - | - | - | 9,673 | 10.190 | - | - | - | - | - | - | BBB |
| KEPC | 9.5 | - | - | - | - | 9.476 | 9.502 | - | - | - | - | - | - | - |
| OHPC | 10.4 | - | - | - | - | - | - | - | - | - | - | - | - | BBB |
| GPU | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| MEEC | 6.3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| PEEC | 6.7 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| CEIL | 5.9 | 12.4 | 22.2 | 9.8 | 6.8 | 10,614 | 10,715 | $ 6.32 | $19.99 | $ 0.30 | $ 1.04 | 14.7 | 7.1 | A |
| CEIP | 5.3 | - | - | - | - | - | - | - | - | - | - | - | - | AA |
| COEC | 6.1 | 21.5 | 25.6 | - | 15.3 | 10,933 | 11,094 | $ 8.02 | $13.90 | $ 0.40 | $ 0.72 | 14.8 | 7.9 | AA |
| ILPC | 6.1 | 13.0 | 26.8 | 11.9 | 10.4 | 10,328 | 10,041 | $ 5.27 | $15.04 | $ 0.27 | $ 0.78 | 13.7 | 7.44 | AA |
| IOIG | 6.82 | 20.29 | - | 12.56 | 8.38 | 12,399 | 11,457 | $ 8.46 | $17.33 | $ 0.38 | $ 0.59 | 13.7 | 6.5 | A |
| UNEC | 7.8 | 16.6 | 29.6 | - | - | 10,987 | 10,393 | $ 6.42 | $15.29 | $ 0.30 | $ 0.71 | 17.1 | 8.9 | BBB |
| INPL | 5.5 | 19.3 | 35.0 | 12.7 | 12.2 | 10,300 | 10,403 | $ 5.94 | $14.68 | $ 0.269 | $ 0.675 | 18.0 | 10.5 | A+ |
| NOIP | 6.5 | 7.4 | 11.1 | 12.8 | 10.5 | 10,204 | 10,329 | $ 7.41 | $16.29 | $ 0.342 | $ 0.806 | 16.0 | 8.7 | AA |
| PSIN | 7.35 | 17.1 | 30.8 | 18.4 | 14.5 | 10,569 | 10,193 | $ 5.59 | $14.17 | $ 0.255 | $ 0.656 | 17.0 | 9.14 | AA |
| SOIG | 8.0 | 9.7 | - | 14.2 | 9.4 | 11,280 | 10,556 | $ 4.68 | $11.78 | $ 0.26 | $ 0.57 | 14.6 | 7.4 | AA |
| KEUC | 6.3 | 17.5 | 27.1 | 11.6 | 10.2 | 11,106 | 10,745 | $ 8.32 | $ 5.87 | $ 0.52 | $ 0.74 | 17.30 | 7.25 | A |
| LOGE | 7.5 | 11.9 | 21.3 | 14.5 | 12.9 | 10,259 | 10,053 | $16.65 | $13.80 | $ 0.27 | $ 0.63 | 22.8 | 14.4 | AA |
| CIGE | 6.6 | 12.8 | 25.0 | 13.4 | 9.6 | 10,308 | 10,252 | $ 7.58 | $20.14 | $ 0.37 | $ 1.009 | 16 | 8 | A |
| CLEI | - | - | - | - | - | 10,256 | 10,322 | $ 9.03 | $23.98 | $ 0.4051 | $ 1.055 | - | - | A |
| COSO | 6.8 | 17.8 | 30.3 | 19.2 | 14.6 | 10,900 | 10,600 | $ 6.38 | $19.85 | $ 0.32 | $ 0.95 | 22.1 | 10.3 | BBB |
| DAPO | 6.87 | 16.1 | 24.9 | 18.2 | 11.9 | 10,120 | 10,106 | $ 9.86 | $21.96 | $ 0.43 | $ 1.03 | 16.6 | 7.9 | BBB |
| OHEC | 6.0 | 18.4 | 32.9 | 15.5 | 12.5 | 10,246 | 10,546 | $ 7.36 | $20.65 | - | - | 19.0 | 9.21 | A- |
| PEPC | 4.7 | - | - | - | - | - | - | - | - | - | - | - | - | A- |
| TOEC | 10.0 | 20.7 | 27.4 | 17.2 | 10.8 | 10,037 | 9,963 | $10.12 | $25.40 | $ 0.44 | $ 1.12 | 17.4 | 8.9 | BBB |
| DULC | 5.54 | 21.09 | 32.85 | 13.64 | 8.82 | 11,204 | 10,628 | $ 7.63 | $22.78 | $ 0.34 | $ 1.03 | 21 | 10 | AA |
| PEPL | 5.8 | - | - | - | - | - | - | - | - | - | - | - | - | BBB |
| PHEC | 5.4 | 31.2 | 39.3 | 17.9 | 13.2 | 9,314 | 9,639 | $10.06 | $25.81 | $ 0.59 | $ 1.24 | 17.1 | 7.7 | BBB |

NOTE: Additional data and data sources in Appendix E of this report.

environmental control equipment contribute to the yearly changes. However, fuel costs have risen consistently over the last six years. In current dollars, fuel costs in 1976 were generally three times what they were in 1971. In 1971 dollars though, the percentage increases are less dramatic, growing only between 25 percent and 128 percent over the six year period (Table 15).

In addition, the average cost of fuel per million Btu rose for most utilities, although not uniformly as evidenced by the wide variation in percentage increases, ranging from 42 percent to 246 percent. Increases calculated in terms of 1971 dollars were not as great, falling between 50 percent to 150 percent for most utilities. Two interesting exceptions should be noted. In 1971 dollars, average costs per million Btu increases only 2 percent at Kentucky Utilities Company and 11 percent at Iowa-Illinois Gas and Electric Company; these slight increases may be due to the existence of long-term fuel contracts. Furthermore, the 29 percent increase at Commonwealth Edison Co. was significantly lower than the remaining utilities, probably as a result of the company's large scale use of nuclear power.

## Utility Ratings

Underlying a utility's ability to maintain and expand its service is its ability to attract new capital. The money can be raised in essentially two ways: through the issuance of new stock or borrowing through the sale of bonds or notes. The ease with which the utility attracts the capital is highly dependent on its previous performance. The greater the risk is for the investor, the more the money will cost the utility in dividends or interest payments.

The Standard and Poor's Corporation has rated many of the utilities in the ORBES states; this rating is a current assessment of the utility's

## TABLE 15

## PERCENTAGE INCREASES IN REAL FUEL COSTS: AVERACE COST PER TON AND AVERAGE COST PER MILLION BTU

| State/ Company Code | Fuel: Average Cost per Ton 1971 | Fuel: Average Cost per Ton 1976 | Fuel: Average Cost per Ton % Increase in Real Costs (1971-1976) | Fuel: Average Cost per $10^6$ Btu 1971 | Fuel: Average Cost per $10^6$ Btu 1976 | Fuel: Average Cost per $10^6$ Btu % Increase in Real Costs (1971-1976) |
|---|---|---|---|---|---|---|
| IL CEIL | 6.31 | 19.99 | 128 | 0.30 | 1.04 | 149 |
| COEC | 8.02 | 13.90 | 24 | 0.40 | 0.72 | 29 |
| ILPC | 5.27 | 15.04 | 105 | 0.27 | 0.78 | 107 |
| IOIG | 8.46 | 17.33 | 47 | 0.38 | 0.59 | 11 |
| UNEC | 6.42 | 15.29 | 71 | 0.30 | 0.71 | 70 |
| IN INPL | 5.94 | 14.68 | 78 | 0.27 | 0.68 | 81 |
| NOIP | 7.41 | 16.29 | 58 | 0.34 | 0.81 | 71 |
| PSIN | 5.59 | 14.17 | 82 | 0.26 | 0.66 | 82 |
| SOIG | 4.68 | 11.78 | 81 | 0.26 | 0.57 | 57 |
| KY KEUC | 8.32 | 16.65 | 43 | 0.52 | 0.74 | 2 |
| LOGE | 5.87 | 13.80 | 69 | 0.27 | 0.63 | 67 |
| OH CIGE | 7.58 | 20.14 | 90 | 0.37 | 1.00 | 94 |
| CLEI | 9.03 | 23.98 | 90 | 0.41 | 1.06 | 85 |
| COSO | 6.38 | 19.85 | 123 | 0.32 | 0.95 | 113 |
| DAPO | 9.86 | 21.96 | 60 | 0.43 | 1.03 | 72 |
| OHEC | 7.36 | 20.65 | 101 | -- | -- | -- |
| TOEC | 10.12 | 25.40 | 80 | 0.44 | 1.12 | 83 |
| PA DULC | 7.63 | 22.78 | 115 | 0.34 | 1.03 | 117 |
| PHEC | 10.06 | 25.81 | 84 | 0.59 | 1.24 | 51 |
| APSI | --- | --- | -- | 0.28 | 0.97 | 148 |

$$\text{Percentage increase in real fuel costs (1971-1976)} = \left\{ \frac{\dfrac{\text{Average Fuel Cost/Ton-1976}}{\text{(Average Fuel Cost/Ton-1971}}}{\dfrac{\text{(Implicit GNP Price Deflator-1976}}{\text{(Implicit GNP Price Deflator-1971}}} \times 100 \right\} - 100$$

where: implicit GNP price deflator-1976 = 133.9 and implicit GNP price deflator-1971 = 96.0

This gives an indication of how much fuel costs rose in relation to prices of all goods and services. The real increase in average fuel cost/million Btu can be calculated in a similar fashion.

SOURCES: Statistical Abstract of the United States-1978, Table 783 "Gross National Product, Implicit Price Deflators: 1960-1977" p. 483
Additional data from Appendix E of this report

credit-worthiness. The ratings range from AA to BBB where:

> AA Bonds rated AA also qualify as high-quality debt obligations. Capacity to pay principal and interest is very strong, and in the majority of instances they differ from AAA issues only in small degree.
>
> A Bonds rated A have a strong capacity to pay principal and interest although they are somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions.
>
> BBB Bonds rated BBB are regarded as having adequate capacity to pay principal and interest. Whereas they normally exhibit protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay principal and interest for bonds in this category than for bonds in the A category.
>
> BB, B, CCC, CC Bonds rated BB, B, CCC, and CC are regarded, on balance as predominantly speculative with respect to the issuer's capacity to pay interest and repay principal in accordance with the terms of the obligation. BB indicates the lowest degree of speculation and CC the highest degree of speculation. While such bonds will likely have some quality and protective characteristics, these are outweighed by large uncertainties or major risk exposures to adverse conditions.

In the bond rating process, subjective as well as objective factors are considered.[2] Typically, a rating agency such as Standard and Poor's would examine a number of criteria before assigning a bond rating. It would conduct a general analysis of the company, including the revenues, earnings, and investment mix, the utility's service area, and the quality of service. It would also evaluate the size of the company's construction program, relative to its capitalization; the financial flexibility of the company, and the coverage ratios.

The regulatory climate in which the utility operates is also an important, albeit difficult, part of the bond evaluation process. The rating agency determines the likelihood of future rate increases by examining the utility's future rate increase needs and past success in obtaining rate relief in conjunction with the prevailing sentiments of the public utility commission. Based on these factors, estimates of the utility's probable earnings and cash flow situation can be made. These estimates are used to evaluate the adequacy of the company's construction plans, debt service requirements, financing plans, and capital structure objectives.

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[2] This discussion is based on: Marvin E. Ray, "A New Twist for the Management Audit and Bond Ratings" in Public Utilities Fortnightly, 105 No. 2 Section 1, (January 17, 1980) p. 34.

Finally, the company management is evaluated. Attention is given to management's ability to meet the company's objectives, planning sophistication, and credibility with the financial community, the public, the media, and the regulatory agencies.

Thus the rating a utility receives is based on many factors. As a result, it is difficult to identify those which are most responsible for the overall rating. This is particularly true of the subjective criteria such as the evaluation of the management and of the regulatory environment. However, the record indicates that the utilities in the ORBES states were highly rated in 1976 with two-thirds of them achieving an "A" category or better, while the other one-third received a "BBB" rating. Since 1976 many of these ratings have been placed in jeopardy as a result of a number of problems including the Three Mile Island accident, the lower than anticipated demand for electricity and the increasing cost of capital. Under these new circumstances, the electric utility industry in the ORBES states will have great difficulty in maintaining their traditionally high ratings.

# CHAPTER VIII

# REGULATION IN THE ELECTRIC UTILITY INDUSTRY

## Legal Basis for Regulation

The electric utility industry is generally considered a natural monopoly, because the expense of duplicating the generation, transmission and distribution systems would exceed the benefits of competition. Therefore, since the free market does not set the price of electricity, it has been agreed that the government should regulate the private corporations which produce and transmit electricity.

Today, governmental regulation of the electrical generating industry occurs at the federal, state, and local level, and applies to virtually every aspect of the business endeavor from fuel purchasing to consumer billing. Each exercise of regulatory control over electric utilities by a governmental unit must be supported by some recognized governmental power. The sources of these powers are determined by the federal structure of our government.

The federal government may exercise only those powers which are enumerated in the Constitution of the United States. All other governmental powers are retained by the individual state governments which may legislatively delegate these powers to local levels of government or various administrative agencies.

The enumerated powers upon which federal regulation of electric utilities is based include the power to regulate interstate commerce,[1] to exercise authority over federal enclaves,[2] to dispose of and regulate all other property belonging to the United States,[3] to impose taxes and spend for the general welfare,[4] and to provide for national security.[5] Of these powers, the power to regulate interstate commerce is the source of most federal regulatory authority over electric utilities.

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[1] U.S. CONST. Art. I § 8, Cl.3

The fundamental source of state authority to regulate electric utilities is the police power, which enables a state to regulate for protection of the public health, safety, morals, and welfare. This power is extremely broad and limited only by state or federal constitutional provisions. The primary constraints upon the police power are ones of due process rather than substance. In other words, state regulation of private activity to protect the public health, safety, welfare or morals will not be restricted unless it can be demonstrated that the activity is unrelated to the public interests, the means of regulation are not reasonably related to protecting the public interest or the regulation is arbitrary or unreasonable. The public interest in electric utility service is clearly compelling, and thus is the basis for reasonable state regulation of this private activity.

The federal powers discussed above have resulted in many federal programs which regulate electric utilities directly, including the Federal Power Act,[6] and the Atomic Energy Act.[7] Utilities and other businesses are also affected by various environmental protection programs,[8] the several antitrust and securities acts,[9] and the various regulatory activities under the Department of Energy.[10] The most common format in which the state exercises authority over electric utilities is through a legislative delegation of power to an independent public utility commission (PUC).

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[2] Id. Art. I § 8, cl.1

[3] Id. Art. IV § 3, cl. 2 the distinction between Article I federal property (see note 2 above) and Article IV federal property has particular significance with respect to the power of states to regulate private activity on such land. Within the ORBES states, this issue may not be as significant as in western states where there are large federal holdings. See, M. D. White, H. J. Barry III, Energy Development in the West: Conflict and Coordination of Governmental Decision Making, 52 N.D.L. REV. 451, 499 (1976).

[4] U.S. CONST. Art. I § 8 cl. 17

[5] Id.

[6] 49 Stat. 838, 16 USC § 791A et seq. (1970)

This discussion will focus upon the federal regulatory authority over utilities embodied in the Federal Power Act and the regulatory format of state public utility commissions.

## Federal Regulation of the Electric Utility Industry

The Department of Energy (DOE) consolidated all energy-related federal regulatory efforts into two DOE agencies, the Federal Energy Regulatory Commission (FERC) and the Economic Regulatory Administration (ERA). These two agencies carry out the bulk of federal regulation of electric utilities, regulation previously carried out by the Federal Power Commission.[11]

The source of FERC and ERA authority to regulate electric utilities is the Federal Power Act.[12] This legislation was enacted to fill a gap in the regulation of electric utilities. This gap arose from the so-called Attleboro decision, a Supreme Court determination that the "commerce clause" of the U.S. Constitution prevented state PUC's from regulating interstate sales or transmission of electric energy, even in the absence of any federal regulation.[13]

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[7] Atomic Energy Act of 1954, Pub. L. 83-703 (as amended); 42 USC 2010 et. seq. (1970), especially §§ 2164, 2131

[8] *See* eg.: Clean Air Act Pub. L. 91-604, as amended by Publ. L. 92-157, Pub. L. 93-15, Pub. L. 93-319, Pub. L. 95-95 (codified at 42 USC § 7401 et seq. 1977 supp.)

[9] *See* eg.: Public Utility Holding Company Act of 1935, 15 USC §§ 79-79Z (1970); Securities Exchange Act 15 USC 78 et seq. (1970)

[10] *See*: Department of Energy Organization Act, Pub. L. 95-91, August 4, 1977; Department of Energy Fact Book, Organizations and Functions; (September, 1977)

[11] This reallocation of regulatory authority is spelled out in the Department of Energy Organization Act, Pub. L. 95-91, August 2, 1977 (codified at various sections of titles 3, 57, 12, 15, 42 of USC)

The Federal Power Act is composed of two major sections, which are actually two separate pieces of legislation. Part I of the Act deals with the permitting and licensing of hydroelectric facilities on the navigable waters of the U.S. and was originally the Federal Water Power Act. Part II dealing with the regulation of electric utility companies engaged in interstate commerce was enacted in 1935 as the Public Utility Holding Company Act of 1935, an amendment of the Federal Water Power Act.

This discussion will focus upon Part II of the Federal Power Act (hereinafter the Act). Under the current interpretations of the Act, federal authority to regulate the interstate aspects of electric utility companies extends further than that necessary to fill the regulatory gap created by the Attleboro decision. The reach of regulatory authority of the Act is based upon court construction of the language and the legislative history of the act.[14]

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[12] 49 Stat. 868, 16 USC § 791 A et seq. (1970)

[13] Public Utilities Comm'n v. Attleboro Steam and Elec. Co., 273 U.S. 83 (1927)

[14] See 2 Priest, Principles of Public Utility Regulation at 550: Federal Power Comm'n v. Southern California Edison Co., 376 U.S. 205 (1964). The issue of federal or state jurisdiction over sales in interstate commerce has been extensively litigated. Although these issues are important to understanding the respective state and federal authority, the legal distinctions between jurisdiction based upon the commerce clause limitation on state authority and the plenary authority granted by the language of the Act are too involved to warrant discussion here. (continued)

Essentially the Act grants the FPC (now FERC or ERA) the authority to regulate the transmission of electric energy in interstate commerce and the sale of electric energy at wholesale in interstate commerce.[15] Generating facilities, local distribution facilities, wholly intrastate transmission facilities, and transmitter consumed electricity are exempted from the reach of this authority.[16]

For those utilities which sell or purchase electric energy for resale in interstate commerce, or transmit power in interstate commerce, which includes the bulk of the large investor-owned utilities, the FERC exercises authority very similar to the state PUC with respect to such interstate activity. Thus, FERC reviews all rates and charges,[17] approves disposition of property,[18] ensures the adequacy of interstate facilities,[19] specifies the forms of accounts and depreciation,[20] and supervises the issuance of securities.[21]

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The question of what constitutes transmission or sale in interstate commerce and hence triggers FERC jurisdiction has been extensively litigated for the purposes of the Act. Interstate electricity is defined as being transmitted from a state and consumed at any point outside of that state. Thus, a public utility located entirely within a state with no connections with any out-of-state system is not subject to FERC jurisdiction as operating facilities for the transmission of electrical energy in interstate commerce, even though it is connected with in-state utilities which, in turn, connect to out-of-state utilities and even though it is a member of a multi-state power pool. *Florida Power and Light Co. v. FPC*, 430 F2d 1337 (CA5 1969).

[15] Federal Power Act § 201 (b), 16 USC § 824 (b)

[16] *Id.*

[17] *Id.* § 205, 16 USC § 824 (d)

[18] *Id.* § 203 16 USC § 824 (c)

[19] *Id.* § 207 16 USC § 824 (b)

[20] *Id.* § 303 16 USC § 824 (g)

[21] *Id.* § 204 16 USC § 824 (f). FERC authority to regulate the issuance of securities by public utilities is limited only to those utilities which are not subject to any state security review. Presumably this would apply to W. Va.

In addition FERC has authority to order utilities subject to its jurisdiction to establish physical connections of transmission facilities, but only when the public interest is served by such connection and when no undue hardship or impairment of service capability results.[22] Additional interconnection powers under the Act have been delegated by the Secretary of the DOE to the ERA; these include coordinating voluntary interconnections[23] and emergency interconnections.[24] In addition, the ERA regulates the international export of electricity,[25] and reviews interlocking directorates between public utilities and security-issuing institutions.[26]

The powers exercised by both FERC and ERA may be coordinated with the efforts of state PUC, but this coordination and consultation is strictly voluntary.[27]

## State Regulatory Commissions

### Background

In most states in the United States and in all of the ORBES states, the power to regulate electric utilities has been legislatively delegated to state-wide public utility commissions (PUC). These administrative agencies have fairly broad powers to regulate the operations of electric utilities, but only those powers which can be traced to the enabling legislation. Therefore, although the state may have the legal authority to regulate certain aspects of a utilities operation, unless the state legislature has specifically delegated this authority, the PUC is without that power. This derivative characteristic of PUC authority is especially important when implementing changes in the regulatory format. PUC's authorities are very similar from state to state and most often include the authority and duty to fix the rates for service, ensure the adequacy of service, supervise the fiscal structure of the utility, certify additions to capacity or service area, approve mergers, transfers, or consolidations of utilities, supervise the issuance of equity securities and the acquisition of indebtedness,[28] give permission of abandonment of franchises, and in general, supervise every aspect of a utility's operation. The goal of this supervision is to ensure that every utility:

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[22] Id. § 202 (b), 16 USC § 824A (b)

[23] Id. § 202 (a), 16 USC § 824A (c)

[24] Id. § 202 (c), (d), 16 USC § 824A (c), (d)

[25] Id. § 202 (e), 16 USC § 824A (e)

[26] Id. § 209, 16 USC § 825 (d)

[27] Id. § 209, 16 USC § 824 (h)

> ...shall establish and maintain adequate and suitable facilities, safety appliances, and other suitable devices, and shall perform such service in respect thereto as shall be reasonable, safe, and sufficient for the security and convenience of the public...[29]

Although the language varies from state to state the essence is the same: "adequate service at reasonable rates."

The policy justification for such pervasive regulation arises from a combination of the semi-monopolistic status of most utilities, the public interest in the essential services supplied, and the preference for private ownership and operation of utilities. Thus, when essential public services are to be provided by private interests in a relatively competition free market, public regulation is necessary to protect the public's interest.[30] A result of this perception is that "... regulatory commissions view their assignment as a mandate to do the job that competition would do if competition were desirable or feasible in the markets for public utility service."[31]

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[28] The West Virginia Public Service Commission (PSC) is one of a handful of state commissions that do not regulate the issuance of utility securities, under the provisions of the Federal Power Act § 204F, FERC will exercise such authority where a state does not.

[29] W. VA. CODE 24-3-1 (Michie 1976)

[30] See: I. Priest, Principles of Public Utility Regulation, a 4 (Michie Co., 1969)

## Rate Regulation

PUC regulation of the rates of utilities probably generates more public attention and awareness than any other PUC activity. This attention has increased in recent years primarily due to the increased frequency of rate relief requests by utilities of all sorts, and proposed modifications of traditional electric structures to serve various non-traditional goals.

In most jurisdictions the legislative grant of authority to the PUC to regulate rates is very broad. The statutory restrictions on PUC discretion in rate regulation are typically limited to requiring rates to be "just and reasonable"[32] and non-discriminatory.[33] In Ohio, however, the legislature has specified the procedures and determinations which the commission must follow in fixing rates.[34] This legislative specification limits the discretion of the Ohio PUC to use differing techniques for rate determination. This limitation may be insignificant as a practical matter because the Ohio legislative mandates follow widely accepted practices for rate determination.

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[31] H. P. Wald, "Recent Proposals for Redesigning Utility Rates," 92 Public Utilities Fortnightly. (September 13, 1973) p. 27.

[32] This standard is found in the PUC enabling legislation for each of the ORBES states: ILL. ANN. STAT. ch. 111 2/3 § 32 (Smith Hurd); IND. CODE ANN § 8-1-2-4 (Burns); KY REV. STAT. § 278.030; OHIO REV. CODE § 4909.15; W. VA. CODE § 24-2-3 (Michie 1976); PA. STAT. ANN. tit. 66 § 1141 (Purdon)

[33] This standard is also uniformly expressed legislatively, ILL. ANN. STAT. ch. 111 2/3 § 38 (Smith Hurd): IND. CODE ANN. § 8-1-2-106 (Burns); KY REV. STAT. § 278.170; OHIO REV. CODE § 4905.33; W. VA. CODE § 24-3-2 (Michie, 1976); PA. STAT. ANN. tit. 66 § 1143 (Purdon's)

[34] OHIO REV. CODE §§ 4909.15 et seq. (Page 1977)

The traditional approach to PUC rate setting involves four basic determinations: (1) what utility property is used to provide the service, this constituting the rate base (2) what are the utility's operating expenses, (3) what rate of return should be applied to the rate base to establish an adequate return on investment, (4) what are the gross revenues from a given rate structure.[35]

Typically these data are derived by examining a test year of service and then projecting this figure ahead to the period covered by the proposed rate structure. Operating expenses, plus the required return on capital investments, make up the gross revenue requirements that must be generated by a given rate.

This rate structuring process is directed at providing an opportunity for a utility to generate enough revenue to make an adequate return on its investments and thereby attract new capital that may be necessary to continue or expand its operations. The treatment of operating expenses, the manner of valuing property used in the rate base, the determination of an appropriate ratio between debt and equity capitalization, and the company's accounting practices all become crucial issues in making a rate determination, and all have been excessively litigated. A detailed discussion of these issues is beyond the scope of this report.[36]

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[35] See: I. Priest, Principles, at 45

[36] Several of these fairly esoteric issues may be of particular significance to ORBES efforts and warrant more detailed examination. PUC treatment of construction work in progress (CWIP) is particularly significant with respect to the issue of capital acquisition for major capacity expansions. Traditionally, only that utility property used to supply service could be part of the rate base to compute revenue requirements. Projects under construction were excluded from the rate base resulting in greater capital requirements for expansion. Some PUCs now allow CWIP in the rate base, thus, in effect having present consumers finance future capacity.

## Rate Structure Reform

A common feature of the most prevalent rate reform proposals is that they seek to expand the type and nature of the considerations the utility and the PUC make with respect to rate structures. This expanded scope focuses upon issues of conservation and social welfare. The conservation type proposals include peak load pricing rate structures, elimination of promotional or declining block rates, seasonal rates, and interruptible service rates. The social welfare approach to rate reform is typified by life-line rates which would provide a minimal amount of service to low income persons at a reduced rate.

It should be noted that these proposals for rate reform focus upon rate structure not rate level. Traditionally the structure of the rates between classes and types of customers has been left to the individual utility's discretion to a larger extent than overall rate levels.[37] Thus as these types of proposals are implemented through governmental policy, a new field of regulatory standards will be opened up. In addition to the standards of adequate service at reasonable rates, PUC review of rate-making may expand to consider conservation standards of promoting efficient use of energy, and standards for implementing social welfare goals.

There is a level of tension between the conservation and social welfare approach to rate reform and the traditional legal standards applied to rate structuring. This tension is most evident between life-line rates and the standard prohibiting undue discrimination among customers. In granting lower rates to certain classes of customers based upon their economic status and not upon any differentials relating to the service supplied, the issue of discrimination is raised. Although it may be argued that such discrimination is reasonable, some courts have held that, because of the prohibition on discrimination, a strict interpretation of PUC authority requires legislation if life-line rates are to be implemented.[38]

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[37] I. Priest at 342-343.

Similar tensions occur between eliminating promotional rates and the cost-of-service standard, although these are more readily resolved due to the shift occuring in economies of scale in the electric utility industry.[39]

This expanded scope of regulatory review will require a more sophisticated method of balancing these diverse objectives in rate structuring, and a substantial increase in PUC staff if the agency is to keep on top of its workload.

Legislation currently pending in the U.S. Congress, if passed, would require state PUC's to consider implementing the types of rate reforms mentioned above.[40] Given the tentative nature of the national energy policy it is premature to report upon the precise configuration of such legislation. However, it is fairly safe to say that the scope of regulatory concern with the structure and allocation of rates will expand greatly in the near future, both in issues covered and in level of conflict among the objectives of the rates.[41]

Two other questions have arisen as a result of the increasing dependency of municipal utilities on power purchased from investor-owned utilities. Both are related to the pricing structure which governs the cost of the wholesale power purchased by the municipals. The first involves the problems of "pancaking" which arises when the investor-owned utilities are granted successive temporary rate increases before final action on earlier requests is completed.

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[38] See eg.: RE: Rate Concessions to Poor Persons and Senior Citizens, 14 PUR 4th 87 (Ore. PSC), Moore v. Gilbert 131 Vt. 545, 310 A 2d 27 (1973); Pennsylvania Public Utility Commission v. Philadelphia Electric Co. 91 PUR 3d 321 (PA. 1971). RE: Louisville Transit Co. 82 3d 1, (KY 1969)

[39] See: West Virginia Public Service Commission, "Systems and Polices for the Pricing of Electrical Power in West Virginia." (December 31, 1975), p. 5

[40] See: D. Reed, "Utility Rates Under the National Energy Act; Quo Vadis?" Public Utilities Fortnightly. 102 (July 20, 1978) p. 11

[41] Id. at 15.

The second area of conflict involves what is known as a "price squeeze." Municipal utilities contend that their customers must pay more than the customers or areas served by the investor-owned utility for comparable service, even when the municipal utility purchases the power at wholesale rates.

## Adequacy of Service Regulations

In addition to the regulations of rates, PUC's have a duty to insure that the utility provides adequate service. This duty is carried out in several ways. The most prevalent technique for electric utilities to extend or enlarge services is to obtain a certificate of convenience and necessity from the PUC. This certificate typically authorizes the utility to provide service in a designated geographic area, and ensures that the utility will not be subject to direct competition by another utility offering the same service.[42] In exchange for this authorization, the utility is under a duty to provide service in that area until the PUC orders otherwise. This duty to provide service has been construed by many courts and in statutory language to include a duty to anticipate and provide for reasonable extension of facilities to meet probable future demand. A number of courts have held that this expansion of service obligation is not limited by considerations of immediate profit to the utility.[43]

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[42] See: ILL. ANN. STAT. ch. 111 2/3 § 56 (Smith-Hurd); IND CODE ANN § 8-1 2-5 (Burns); KY REV. STAT. § 278.025; OHIO REV. CODE § 4906.10 et seg. (Page); W. VA. CODE § 24-2-11 (Michie 1976); PA. STAT. ANN. tit. 66 § 1122 (Purdon).

[43] See: I. Priest, Principles, p. 232.

In the electric utility industry, the issue of the service obligation has not been of great significance in the past, as most utilitites were eager to expand their capacity both to realize the economies of scale possible with a larger capacity, and to increase their rate base and ensure continued growth. However, as the economics of increased capacity shift with the higher costs of additional capacity, and the difficulty in obtaining suitable sites for generating facilities, the legal issues of the service obligation may become increasingly significant.

# CHAPTER IX

# CONCLUSION

Electricity is considered a necessity in the United States today. The electric utility industry is mandated to provide sufficient electric power to meet both present and future needs. Meeting future needs requires that the utilities anticipate the extent of these demands and insure that facilities are available to meet these needs. Thus the electric utility industry is a major force controlling the growth of electric conversion facilities in the six-states of the ORBES region. For this reason, understanding the basic functions of the industry is essential to ORBES as a whole. This report covered many of the important components: institutions, technology, governmental regulations and financial affairs. All of these provide insight into the operation of the electric utility industry.

# APPENDIX A

# GLOSSARY

A - A statewide association of rural electric cooperatives

AEPS - American Electric Power Systems

AIEC - Association of Illinois Cooperatives

ALEC - Allegheny Electric Cooperative, Inc.

APPC - Appalachian Power Co.

APSI - Allegheny Power Systems

BIRI - Big Rivers Electric Corp.

BUPI - Buckeye Power Inc.

CAPCO - Central Area Power Coordinating Group

CECO - Citizen's Electric Corporation, Ste. Genevieve, Mo.

CEIL - Central Illinois Light Co.

CEIP - Central Illinois Public Service Co.

CFC - National Rural Utilities Cooperative Finance Corporation

CIGE - Cincinnati Gas & Electric Co.

CLEI - Cleveland Electric Illuminating Co.

COEC - Commonwealth Edison Co.

COSO - Columbus & Southern Ohio Electric Co.

D - Distribution Utility or Cooperative

DAPO - Dayton Power & Light Co.

DULC - Duquesne Light Co.

DLPC - Dairyland Power Cooperative, LaCrosse, Wi.

EAKR - East Kentucky Power Coop.

ECAR - East Central Area Reliability Coordination Agreement

F - Federally-owned power agency

FERC - Federal Energy Regulatory Commission

G - Generation and transmission Utility or Cooperative

GPU - General Public Utilities Co.

HEDI - Hoosier Energy Division, Indiana Statewide Rural Electric Corp.

ICC - Illinois Commerce Commission

ILPC - Illinois Power Co.

IMP - Illinois-Missouri Pool

INME - Indiana & Michigan Electric Co.

INPL - Indianapolis Power & Light Co.

IPSC - Indiana Public Service Commission

ISCC - Iowa State Commerce Commission

JECP - Jersey Central Power & Light Co.

KAEC - Kentucky Association of Electric Cooperatives

KEPC - Kentucky Power Co.

KEUC - Kentucky Utilities Co.

KPSC - Kentucky Public Service Commission

LOGE - Louisville Gas & Electric Co.

M - Municipal Utility

MAAC - Mid-Atlantic Area Council

MAIN - Mid America Interpool Network

MARCA - Mid-Continent Area Reliability Coordination Agreement

MEEC - Metropolitan Edison Co.

MOPC - Monongahela Power Co.

MPSC - Michigan Public Service Commission

MoPSC - Missouri Public Service Commission

NRECA - National Rural Electric Cooperative Association

NOIP - Northern Indiana Public Service Co.

OHEC - Ohio Edison Co.

OHPC - Ohio Power Co.

OHVE - Ohio Valley Electric Corp.

OREC - Ohio Rural Electric Cooperative, Inc.

PEEC - Pennsylvania Electric Co.

PEPL - Pennsylvania Power & Light Co.

PHEC - Philadelphia Electric Co.

PJM - PJM Interconnection

POAS - Power Authority of the State of New York

POEC - Potomac Edison Co.

PPUC - Pennsylvania Public Utilities Commission

PSIN - Public Service Company of Indiana, Inc.

PSCM - Public Service Commission of Maryland

PUC - Public Utility Commission

PUCO - Public Utilities Commission of Ohio

R - Regional Utility

S - State owned power agency

SEC - Securities and Exchange Commission

SEPA - Southeastern Power Administration

SOIG - Southern Indiana Gas & Electric Company

SOIP - Southern Illinois Power Co-operative

SOYP - Soyland Power Cooperative

SPFL - Springfield, City Water, Light & Power

TELE - T. C. Lewis (Industrial/Manufacturing firm)

TEVA - Tennessee Valley Authority

TOEC - Toledo Edison Co.

TPSC - Tennessee Public Service Commission

UNEC - Union Electric Co.

VSCC - Virginia State Corporation Commission Division of Public Utilities

WEIL - Western Illinois Power Cooperatives, Inc.

WEPP - West Penn Power Co.

WVPA - Wabash Valley Power Association

WVPSC - West Virginia Public Service Commission

# APPENDIX B

# INVESTOR-OWNED UTILITIES IN THE SIX ORBES STATES

| UTILITY CODE | UTILITY NAME | LOCATION | PARENT COMPANY | POWER POOL | RELIABILITY COUNCIL | NOTES |
|---|---|---|---|---|---|---|
| | **ILLINOIS** | | | | | |
| CEIL | Central Illinois Light Co. | Peoria, Ill. | | | MAIN | |
| CEIP | Central Illinois Public Service Co. | Springfield, Ill. | | IMP | MAIN | |
| COEC | Commonwealth Edison Co. | Chicago, Ill. | | | MAIN | |
| ELNE | Electric Energy Inc. | Joppa, Ill. | ILPC<br>KEVC<br>CEIP<br>UNEC | | | Owned jointly by Illinois Power Co (20%), Kentucky Utilities (20%), Central Illinois Public Service Co (20%) and Union Electric Co. (40%) to operate Joppa station to supply power to the U.S. Department of Energy's Paducah, Ky. fuel enrichment plant |
| ILPC | Illinois Power Co. | Decatur, Ill. | | IMP | MAIN | |
| INPO | Interstate Power Co. | Dubuque, Iowa | | | MARCA | |
| IOIG | Iowa-Illinois Gas & Electric Co. | Davenport, Iowa | | | MARCA | |
| SHPS | Sherrard Power System | Orion, Ill. | | | | Non-generating utility; distributes power purchased from Iowa-Illinois Gas & Electric (IOIG) |
| SOBW | South Beloit Water, Gas & Electric Co. | Rockton, Ill. | | | | |
| UNEC | Union Electric Co. | St. Louis, Mo. | | IMP | MAIN | Owns three subsidiaries which do not operate in the ORBES States: Missouri Power & Light, Missouri Edison Co., and Missouri Utilities Co. |
| | **INDIANA** | | | | | |
| CEIN | Commonwealth Edison of Indiana | Whiting, Ind. | COEC | | | Wholly owned subsidiary of Commonwealth Edison Co. (COEC) to operate the State Line plant. Power from State Line sold to COEC and Northern Indiana Public Service Co. (NOIP). |
| INKE | Indiana-Kentucky Electric Corp. | Madison, Ind. | OHVE | | ECAR | Subsidiary of Ohio Valley Electric Corp. (OHVE); organized to operate the Clifty Creek Station at Madison, Ind. |
| INME | Indiana-Michigan Electric Co. | Ft. Wayne, Ind. | AEPS | | ECAR | |
| INPL | Indianapolis Power & Light Co. | Indianapolis, Ind. | | | ECAR | |
| NOIP | Northern Indiana Public Service Co. | Hammond, Ind. | | | ECAR | |
| PSIN | Public Service Company of Indiana, Inc. | Plainfield, Ind. | | | ECAR | |
| SOIG | Southern Indiana Gas & Electric Co. | Evansville, Ind. | | | ECAR | |
| | **KENTUCKY** | | | | | |
| KEPC | Kentucky Power Co. | Ashland, Ky. | AEPS | | ECAR | |
| KEUC | Kentucky Utilities Co. | Lexington, Ky. | | | ECAR | Owns Old Dominion Power Co. Norton, Va. |
| LOGE | Louisville Gas & Electric Co. | Louisville, Ky. | | | ECAR | |
| UNLH | Union Light, Heat, & Power Co. | Cincinnati, Oh. | CIGE | | | Non-generating utility; purchases power for distribution from Cincinnati Gas & Electric Co. for sale in Kentucky |

| UTILITY CODE | UTILITY NAME | LOCATION | PARENT COMPANY | POWER POOL | RELIABILITY COUNCIL | NOTES |
|---|---|---|---|---|---|---|
| | OHIO | | | | | |
| CAOE | Cardinal Operating Co. | Brilliant, Ohio | BUPI<br>OHPC | | | Jointly owned by the cooperative, Buckeye Power Inc. (50%) and Ohio Power Co. (50%); operates Cardinal generating plant. |
| CIGE | Cincinnati Gas & Electric Co. | Cincinnati, Ohio | | | ECAR | |
| CLEI | Cleveland Electric Illuminating Co. | Cleveland, Ohio | | CAPCO | ECAR | |
| COSO | Columbus & Southern Ohio Electric Co. | Columbus, Ohio | | | ECAR | |
| DAPO | Dayton Power & Light Co. | Dayton, Ohio | | | ECAR | |
| MIPC | Miami Power Corp. | Miami, Ohio | CIGE | | | Non-generating Company |
| OHEC | Ohio Edison Co. | Akron, Ohio | | CAPCO | ECAR | |
| OHEL | Ohio Electric Co. | | OHPC | | | Operates the Gavin Steam Plant for Ohio Power Co. |
| OHPC | Ohio Power Co. | Canton, Ohio | AEPS | | ECAR | |
| OHVC | Ohio Valley Electric Corp. | Piketon, Ohio | | | ECAR | Owned jointly by 15 investor owned utilities and managed by AEPS; organized to supply power to U.S. Department of Energy's Portsmouth Ohio gaseous diffusion complex. |
| TOEC | Toledo Edison Co. | Toledo, Ohio | | CAPCO | ECAR | |
| | PENNSYLVANIA | | | | | |
| COPO | Conowingo Power Co. | Philadelphia, Pa | PHEC | | | Incorporated in the State of Maryland to develop and operate the Conowingo Hydro-electric project, Harford County, Md. |
| DULC | Duquesne Light Co. | Pittsburgh, Pa. | | CAPCO | ECAR | |
| HERC | Hershey Electric Co. | Allentown, Pa. | PEPL | | | Non-generating utility |
| MEEC | Metropolitan Edison Co. | Reading, Pa. | GPU | PJM | MAAC | Operates York Haven Power Co., a wholly-owned subsidiary |
| PEEC | Pennsylvania Electric Co. | Johnston, Pa. | GPU | PJM | MAAC | Operates Waverly Electric Light & Power Co., a wholly-owned subsidiary. |
| PEPC | Pennsylvania Power Co. | New Castle, Pa. | OHEC | CAPCO | ECAR | |
| PEPL | Pennsylvania Power & Light | Allentown, Pa. | | PJM | MAAC | |
| PHEC | Philadelphia Electric Co. | Philadelphia, Pa | | PJM | MAAC | |
| PHEP | Philadelphia Electric Power Co. | Philadelphia,Pa | PHEC | | | Organized to develop and operate the Conowingo hydroelectric project with its subsidiary the Susquehanna Power Co. |
| SAHW | Safe Harbor Water Power Corp. | Lancaster County, Pa. | | | | 50% of voting stock held by Pennsylvania Power & Light Co. |
| SUSQ | Susquehanna Electric Co. | Philadelphia,Pa | PHEC | | | |
| UGIC | United Gas Improvement Corp. | Philadelphia,Pa | | PJM | MAAC | |
| WEPP | West Penn Power Co. | Greensburg, Pa. | APSI | | ECAR | |

| UTILITY CODE | UTILITY NAME | LOCATION | PARENT COMPANY | POWER POOL | RELIABILITY COUNCIL | NOTES |
|---|---|---|---|---|---|---|
| | **WEST VIRGINIA** | | | | | |
| APPC | Appalachian Power Co. | Roanoke, Va. | AEPS | | ECAR | |
| BEBP | Beech Bottom Power Co. | Windson, W.Va. | OHEC<br>WEPP | | | Jointly owned by Ohio Power Co. (50%) and West Penn Power Co. (50%); organized to operate Windsor Power Station, will operate Beech Botton Station |
| CEOC | Central Operating Station | New Haven, W.Va. | APPC<br>OHPC | | | Jointly owned by Appalachian Power Co. and Ohio Power Co. to operate Philip Sporn plant. |
| KVPO | Kanawha Valley Power Co. | Kanawha River Valley, W. Va. | APPC | | | Owns and operates three hydro-electric power plants located on government owned land. |
| MOPC | Monongahela Power Co. | Fairmont, W. Va. | APSI | | ECAR | |
| POEC | Potomac Edison Co. | Hagerstown, Ma. | APSI | | ECAR | |
| VIEP | Virginia Electric Power Co. | Richmond, Va. | | | | |
| WHEC | Wheeling Electric Co. | Wheeling, W.Va. | AEPS | | | Non-generating utility |

SOURCES: Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

Annual Report, 1977 from the individual companies

Moody's Investor Services, Moody's Public Utility Manual, 1976 (New York, 1977)

NOTES: To prevent multiple entries, a utility is listed only under the state where it maintains its corporate headquarters. Some utilities, however, operate in several states. Utilities operating in the six-state region, but having corporate offices outside the area, are listed in the first state (alphabetically) where it is licensed to operate. The location of the utility is determine by the location of the corporate headquarters as well. Subsidiaries and other companies set up to operate a single station are located at the site of that station.

# APPENDIX C

# PUBLICLY-OWNED UTILITIES IN THE SIX ORBES STATES

| UTILITY CODE[2] | UTILITY NAME[1] | LOCATION[3] | OWNERSHIP[4] | FUNCTION[5] |
|---|---|---|---|---|
| | ILLINOIS | | | |
| | Batavia, City of | Batavia, IL | M | D |
| | Cairo Public Utility Commission | Cairo, IL | M | D |
| CARL | Carlyle Municipal Utility | Carlyle, IL | M | G |
| CHSD | Chicago Metropolitan Sanitary District | Chicago, IL | R | G |
| FMLP | Fairfield Municipal Electric Light Department | Fairfield, IL | M | G |
| GEMU | Geneseo Municipal Utility | Geneseo, IL | M | G |
| | Geneva Municipal Electric Dept. | Geneva, IL | M | D |
| HIGH | Highland Light & Power Dept. | Highland, IL | M | G |
| MCPD | Mascoutah Municpal Light & Water Dept. | Mascoutah, IL | M | G |
| | Naperville Light Dept. | Naperville, IL | M | D |
| PERU | Peru Light Department | Peru, IL | M | D |
| PMIL | Princeton Water & Light Dept. | Princeton, IL | M | G |
| RVLP | Rantoul, Village of | Rantoul, IL | M | G |
| ROCL | Rochelle Electric Department | Rochelle, IL | M | G |
| | Rock Falls Electric Department | Rock Falls, IL | M | D |
| | St. Charles, City of | St. Charles, IL | M | D |
| SPFL | Springfield City Water, Light & Power[6] | Springfield, IL | M | G |
| SUIL | Sullivan Electric Department | Sullivan, IL | M | G |
| UNIL | University of Illinois | Urbana, IL | | G |
| WINK | Winnetka Electric Department | Winnetka, IL | M | G |
| | INDIANA | | | |
| | Anderson Municipal Light & Power | Anderson, IN | M | D |
| | Auburn Electric & Water Dept. | Auburn, IN | M | D |
| BLUF | Bluffton Municipal Light & Water Works | Bluffton, IN | M | G |
| | Columbia City Municipal Electric Department | Columbia City, IN | M | D |
| CRAW | Crawfordsville Electric Light & Power | Crawfordsville, IN | M | G |
| | Edinburgh Water & Light Dept. | Edinburgh, IN | M | D |
| FRAF | Frankfort City Light & Power | Frankfort, IN | M | G |
| | Greendale Utilities | Greendale, IN | M | D |
| | Huntingburg Municipal Light & Water Plant | Huntingburg, IN | M | D |

| UTILITY CODE | UTILITY NAME | LOCATION | OWNERSHIP | FUNCTION |
|---|---|---|---|---|
| | INDIANA(cont.) | | | |
| JMIN | Jasper Municipal Utilities | Jasper, IN | M | G |
| | Lebanon Utilities | Lebanon, IN | M | D |
| LOSP | Logansport Municipal Utilities | Logansport, IN | M | G |
| | Mishawaka Municipal Utilities | Mishawaka, IN | M | D |
| PERI | Peru Utilities | Peru, IN | M | G |
| RICI | Richmond Power & Light[7] | Richmond, IN | M | G |
| | Tell City Electric Department | Tell City, IN | M | D |
| | Tipton Municipal Electric Dept. | Tipton, IN | M | D |
| | Washington City Light & Power | Washington, IN | M | D |
| | KENTUCKY | | | |
| | Benton Electric Plant Bd. | Benton, KY | M | D[8] |
| | Bowling Green Municipal Utilities | Bowling Green, KY | M | D[8] |
| | Frankfort Electric & Water Plant Bd. | Frankfort, KY | M | D |
| | Franklin Electric Plant Bd. | Franklin, KY | M | D |
| | Fulton Electric System | Fulton, KY | M | D[8] |
| | Glasgow Electric Plant Bd. | Glasgow, KY | M | D[8] |
| HEND | Henderson Mun. Power & Light[7] | Henderson, KY | M | G[9] |
| | Hopkinsville Electric Plant Bd. | Hopkinsville, KY | M | D[8] |
| | Madisonville Mun. Light & Water | Madisonville, KY | M | D |
| | Mayfield Electric & Water Systems | Mayfield, KY | M | D |
| | Monticello Electric Plant Bd. | Monticello, KY | M | D[8] |
| | Murray Electric System | Murray, KY | M | D[8] |
| | Nicholasville Municipal Light & Water Division | Nicholasville, KY | M | D |
| OWEN | Owensboro Municipal Utilities[7] | Owensboro, KY | M | G[9] |
| | Paducah Electric Plant Bd. | Paducah, KY | M | D[8] |
| | Princeton Electric Plant Bd. | Princeton, KY | M | D[8] |
| | Russellville Electric Plant Bd. | Russellville, KY | M | D[8] |
| TEVA | Tennessee Valley Authority | Paducah, KY | F | G[10] |
| | | Central City, KY | | |
| CETV | U.S. Department of the Army, Corps of Engineers | Barkley Dam & Lake Project | F | G[11] |
| | | Dale Hollow Lake Project | F | G[11] |
| | | Wolf Creek Dam & Lake Cumberland Project | F | G[11] |

| UTILITY CODE | UTILITY NAME | LOCATION | OWNERSHIP | FUNCTION |
|---|---|---|---|---|
| | OHIO | | | |
| | Bowling Green Bd. of Public Affairs | Bowling Green, OH | M | D |
| | Bryan Light & Water Works | Bryan, OH | M | G |
| | Celina Municipal Utilities | Celina, OH | M | G |
| CLEV | Cleveland, Division of Light & Power[7] | Cleveland, OH | M | G |
| COLU | Columbus, Division of Electricity | Columbus, OH | M | G |
| | Cuyahoga Falls Electric System | Cuyahoga Falls, OH | M | D |
| DOVE | Dover Municipal Light & Power Department | Dover, OH | M | G |
| | Galion, Department of Utilities | Galion, OH | M | |
| HAMI | Hamilton Department of Public Utilities[7] | Hamilton, OH | M | G |
| | Hudson Light & Power | Hudson, OH | M | D |
| LEOH | Lebanon Division of Electricity | Lebanon, OH | M | G |
| | Montpelier Municipal Utilities | Montpelier, OH | M | D |
| | Napoleon Utility Board | Napoleon, OH | M | D |
| | Niles Water & Light | Niles, OH | M | D |
| | Oberlin Municipal Light & Power | Oberlin, OH | M | G |
| ORRV | Orrville Municipal Utilities | Orrville, OH | M | G |
| PAIN | Painesville Electric Power Dept. | Painesville, OH | M | G |
| PIQU | Piqua Municipal Power System | Piqua, OH | M | G |
| SMML | St. Marys Municipal Light & Water | St. Marys, OH | M | G |
| SHBY | Shelby Department of Utilities | Shelby, OH | M | G |
| | Wadsworth Light & Power Dept. | Wadsworth, OH | M | D |
| | Wapakonetta Municipal Light Dept. | Wapakonetta, OH | M | D |
| | Wellington Bd. of Public Affairs | Wellington, OH | M | D |
| | Westerville Light Department | Westerville, OH | M | D |
| | Yellow Springs Light & Power | Yellow Springs, OH | M | D |
| | PENNSYLVANIA | | | |
| CHMU | Chambersburg Municipal Electric Light Dept. | Chambersburg, PA | M | G |
| | Ellwood City Municipal Electric Department | Ellwood City, PA | M | D |
| | Ephrata Light & Power Department | Ephrata, PA | M | D |
| | Grove City Municipal Electric Co. | Grove City, PA | M | D |

| UTILITY CODE | UTILITY NAME | LOCATION | OWNERSHIP | FUNCTION |
|---|---|---|---|---|
| | PENNSYLVANIA(cont.) | | | |
| | Kutztown Municipal Light & Power | Kutztown, PA | M | D |
| | Lansdale Municipal Power Plant | Lansdale, PA | M | D |
| | Lehighton Light & Power Dept. | Lehighton, PA | M | D |
| | Perkasie Borough Electric Light Department | Perkasie, PA | M | D |
| | Quakertown Municipal Electric Department | Quakertown, PA | M | D |
| | Schuylkill Haven Borough Util. | Schuylkill Haven, PA | M | D |
| | WEST VIRGINIA | | | |
| | None | | | |

SOURCES: American Public Power Association, Public Power 37 (January-February 1979) 41-91

Steven D. Jansen, Electrical Generating Unit Inventory, Prepared for the Ohio River Basin Energy Study (November, 1978)

[1] Because of the large number of municipal utilities in the six states, only those municipals with gross annual revenues in excess of $1 million are included.

[2] Company code identify those public utilities and power agencies listed in the Electrical Generating Unit Inventory.

[3] The site of the municipal utilities is assumed to be within the corporate limits of the community. Federal power agencies are located at the site or sites of the associated generating units.

[4] Each publicly-owned utility or power agency is described by one of three catagories: municipal (M), regional (R), and federal (F).

[5] Identifies whether utility functions as a generation and transmission operation (G) or as a distribution operation (D).

[6] Member of Mid-America Interpool Network (MAIN).

[7] Liaison member of East Central Area Reliability Council (ECAR).

[8] Systems which purchase power from the Tennessee Valley Authority.

[9] Municipal wholesaler, which is defined as a publicly-owned utility whose revenues from sales for resale are 51 percent or more of the total electric operating revenue.

[10] Member of Southeastern Electric Reliability Council (SERC).

[11] All power generated at these sites is marketed by the U.S. Department of the Interior, Southeastern Power Administration.

# APPENDIX D

## RURAL ELECTRIC COOPERATIVES IN THE SIX ORBES STATES

| COOPERATIVE NAME [1] | LOCATION [2] | TYPE [3] | AFFILIATION | WHOLESALE POWER SUPPLIERS [4] | NOTES |
|---|---|---|---|---|---|
| **ILLINOIS** | | | | | |
| Adams Electrical Co-operative | Camp Point, Ill. | D | NRECA, AIEC CFC | WEIL | |
| Clay Electric Co-operative, Inc. | Flora, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Clinton County Electric Cooperative, Inc. | Breese, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Coles-Moultrie Electric Cooperative | Mattoon, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Corn Belt Electric Cooperative, Inc. | Bloomington, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Eastern Illinois Power Cooperative | Paxton, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Edgar Electric Co-operative Ass. | Paris, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Egyptian Electric Cooperative Ass. | Steeleville, Ill. | D | NRECA, AIEC CFC | SOIP<br>CECO | |
| Farmers Mutual Electric Company | Geneseo, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Illini Electric Co-operative | Champaign, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Illinois Rural Electric Co. | Winchester, Ill. | D | NRECA, AIEC CFC | WEIL | |
| Illinois Valley Electric Cooperative | Princeton, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Jo-Carroll Electric Cooperative | Elizabeth, Ill. | D | NRECA, AIEC CFC | DLPC | |
| McDonough Power Co-operative | MaComb, Ill. | D | NRECA, AIEC CFC | SOYP | |
| M.J.M. Electric Co-operative | Carlinville, Ill. | D | NRECA, AIEC CFC | WEIL | |
| Menard Electric Co-operative | Petersburg, Ill. | D | NRECA, AIEC CFC | WEIL | |
| Monroe County Electric Co-Operative | Waterloo, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Norris Electric Co-operative | Newton, Ill. | D | NRECA, AIEC CFC | CEIP | |
| Rural Electric Convenience Cooperative Co. | Auburn, Ill. | D | NRECA, AIEC CFC | WEIL | |
| Shelby Electric Co-operative | Shelbyville, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Southeastern Illinois Electric Cooperative | Eldorado, Ill. | D | NRECA, AIEC CFC | SOIP | |
| Southern Illinois Electric Cooperative | Dongola, Ill. | D | NRECA, AIEC CFC | SOIP | |
| **SOIP** -- Southern Illinois Power Co-operative | Marion, Ill. | G | NRECA, CFC, AIEC, MAIN[5] | | Supplies power to three rural cooperatives. |
| Southwestern Electric Cooperative | Greenville, Ill. | D | NRECA, AIEC CFC | SOYP | |
| **SOYP** -- Soyland Power Cooperative | Champaign, Ill. | G | NRECA, CFC, AIEC, MAIN[5] | | Owns 10.5% of planned Clinton 1 & 2, with ILPC and WEIL. |
| Spoon River Electric Co-Operative | Canton, Ill. | D | NRECA, AIEC CFC | WEIL | |

| COOPERATIVE NAME | LOCATION | TYPE | AFFILIATION | WHOLESALE POWER SUPPLIERS | NOTES |
|---|---|---|---|---|---|
| ILLINOIS (cont.) | | | | | |
| Tri-County Electric Cooperative | Mt. Vernon, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Wayne-White Counties Electric Cooperative | Fairfield, Ill. | D | NRECA, AIEC CFC | SOYP | |
| Western Illinois Electrical Cooperative | Carthage, Ill. | D | NRECA, AIEC & CFC | WEIL | |
| WEIL -- Western Illinois Power Cooperative | Jacksonville, Ill. | G | NRECA, CFC, AIEC, MAIN[5] | CEIP<br>ILPC<br>SPFL | Owns 9.5% of planned Clinton 1 & 2, with ILPC and SOYP. |
| Association of Illinois Electric Co-ops | Springfield, Ill. | A | NRECA, MAIN[5] | | |
| INDIANA | | | | | |
| Bartholomew County Rural Electric Membership Corp. | Columbus, Ind. | D | NRECA, ISREC | HEDI | |
| Boone County Rural Electric Membership Corp. | Lebanon, Ind. | D | NRECA, ISREC CFC | INPL<br>PSIN | |
| Carroll County Rural Electric Membership Corp. | Delphi, Ind. | D | NRECA, ISREC CFC | NOIP<br>PSIN<br>WVPA | |
| Clark County Electric Membership Corp. | Sellersburg, Ind. | D | NRECA, ISREC CFC | PSIN | |
| Daviess-Martin County Rural Electric Membership | Washington, Ind. | D | NRECA, ISREC CFC | HEDI | |
| Decatur County Rural Electric Membership Corp. | Greensburg, Ind. | D | NRECA, ISREC CFC | HEDI | |
| Dubois Rural Electric Cooperative, Inc | Jasper, Ind. | D | NRECA, ISREC CFC | HEDI | |
| Fayette Union County Rural Electric Membership Corp. | Liberty, Ind. | D | NRECA, ISREC CFC | HEDI | |
| Fulton County Rural Electric Membership Corp. | Rochester, Ind. | D | NRECA, ISREC CFC | NOIP<br>PSIN<br>WVPA | |
| Hancock County Rural Electric Membership Corp. | Greenfield, Ind. | D | NRECA, ISREC CFC | PSIN<br>WVPA | |
| Harrison County Rural Electric Membership Corp. | Corydon, Ind. | D | NRECA, ISREC CFC | HEDI | |
| Hendricks County Rural Electric Membership Corp. | Danville, Ind. | D | NRECA, ISREC CFC | PSIN<br>WVPA | |
| Henry County Rural Electric Membership Corp. | New Castle, Ind. | D | | | |
| HEDI -- Hoosier Energy Division, Indiana Statewide Rural Electric Corp. | Bloomington, Ind. | G | NRECA, ISREC ECAR[5] | PSIN,<br>SEPA<br>SOIG | Supplies power to 17 rural electric cooperatives. |
| Jackson County Rural Electric Membership Corp. | Brownstown, Ind. | D | NRECA | PSIN | |

| COOPERATIVE NAME | LOCATION | TYPE | AFFILIATION | WHOLESALE POWER SUPPLIERS | NOTES |
|---|---|---|---|---|---|
| INDIANA (cont.) | | | | | |
| Jasper County Rural Electric Membership Corp. | Rensselaer, Ind. | D | NRECA, ISREC<br>CFC | NOIP<br>WVPA | |
| Jay County Rural Electric Membership Corp. | Portland, Ind. | D | NRECA, ISREC<br>CFC | INME<br>WVPA | |
| Johnson County Rural Electric Membership Corp. | Franklin, Ind. | D | NRECA, ISREC<br>CFC | HEDI | |
| Kankakee Valley Rural Electric Membership Corp. | Wanatah, Ind. | D | NRECA, ISREC<br>CFC | NOIP<br>WVPA | |
| Knox County Rural Electric Membership Corp. | Vincennes, Ind. | D | NRECA, ISREC<br>CFC | HEDI | |
| Kosciusko County Rural Electric Membership Corp. | Warsaw, Ind. | D | NRECA, ISREC<br>CFC | NOIP<br>PSIN<br>WVPA | |
| LaGrange County Rural Electric Membership Corp. | LaGrange, Ind. | D | NRECA, ISREC<br>CFC | NOIP<br>WVPA | |
| Marshall County Rural Electric Membership Corp. | Plymouth, Ind. | D | NRECA, ISREC<br>CFC | NOIP<br>WVPA | |
| Miami-Cass County Rural Electric Membership Corp. | Peru, Ind | D | NRECA, ISREC<br>CFC | PSIN<br>WVPA | |
| Morgan County Rural Electric Membership Corp. | Martinsville, Ind. | D | NRECA, ISREC<br>CFC | INPL<br>HEDI | |
| Newton County Rural Electric Membership Corp. | Kentland, Ind. | D | NRECA, ISREC<br>CFC | NUIP<br>WVPA | |
| Noble County Rural Electric Membership Corp. | Albion, Ind. | D | NRECA, ISREC<br>CFC | INME<br>NOIP<br>WVPA | |
| Orange County Rural Electric Membership Corp. | Orleans, Ind. | D | NRECA, ISREC<br>CFC | HEDI | |
| Parke County Rural Electric Membership Corp. | Rockville, Ind. | D | NRECA, ISREC<br>CFC | PSIN<br>WVPA | |
| Rush County Rural Electric Membership Corp. | Rushville, Ind. | D | NRECA, ISREC<br>CFC | HEDI | |
| Shelby County Rural Electric Membership Corp. | Shelbyville, Ind. | D | NRECA, ISREC<br>CFC | HEDI | |
| Southeastern Indiana Rural Electric Membership Corp. | Osgood, Ind. | D | NRECA, ISREC<br>CFC | HEDI | |
| Southern Indiana Rural Electric Cooperative, Inc. | Tell City, Ind. | D | NRECA, ISREC<br>CFC | HEDI | |
| Steuben County Rural Electric Membership Corp. | Angola, Ind. | D | NRECA, ISREC<br>CFC | NOIP<br>WVPA | |
| Sullivan County Rural Electric Membership Corp. | Sullivan, Ind. | D | NRECA, ISREC<br>CFC | HEDI | |

| COOPERATIVE NAME | LOCATION | TYPE | AFFILIATION | WHOLESALE POWER SUPPLIERS | NOTES |
|---|---|---|---|---|---|
| INDIANA (cont.) | | | | | |
| Tipmont Rural Electric Membership Corp. | Linden, Ind. | D | NRECA, ISREC CFC | PSIN | |
| United Rural Electric Membership Corp. | Huntington, Ind. | D | NRECA, ISREC CFC | INME<br>PSIN<br>WVPA | |
| Utilities District of Western Indiana, Rural Electric Membership Corp. | Bloomfield, Ind. | D | NRECA, ISREC CFC | HEDI | |
| Wabash County Rural Electric Membership Corp. | Wabash, Ind. | D | NRECA, ISREC CFC | PSIN<br>WVPA | |
| WVPA — Wabash Valley Power Association, Inc. | Indianapolis, Ind. | G | NRECA, ISREC ECAR, CFC[5] | | Owns with East Kentucky Power Cooperative (EAKR)25% of proposed Marble Hill Nuclear Plant. Public Service Co. of Indiana owns the remaining 75%; supplies power to 21 rural cooperatives in Indiana. |
| Warren County Rural Electric Membership Corp. | Williamsport, Ind. | D | NRECA, ISREC CFC | NOIP<br>PSIN<br>WVPA | |
| Wayne County Rural Electric Membership Corp. | Richmond, Ind. | D | NRECA, ISREC CFC | INME<br>HEDI | |
| White County Rural Electric Membership Corp. | Monticello, Ind. | D | NRECA, ISREC CFC | NOIP<br>WVPA | |
| Whitly County Rural Electric Membership Corp. | Columbia City, Ind. | D | NRECA, ISREC CFC | INME<br>WVPA | |
| Indiana Statewide Rural Electric Cooperative, Inc. | Indianapolis, Ind. | A | NRECA | | |
| KENTUCKY | | | | | |
| BIRI -- Big Rivers Electric Corp. | Henderson, Ky. | G | NRECA, KAEC ECAR[5] | | Supplies power to 3 Kentucky Co-ops. |
| Big Sandy Rural Electric Cooperative Association | Paintsville, Ky. | D | NRECA, KAEC CFC | EAKR | |
| Blue Grass Rural Electric Cooperative Corp. | Nicholasville, Ky. | D | NRECA, KAEC CFC | EAKR | |
| Clark Rural Electric Cooperative Corp. | Winchester, Ky. | D | NRECA, KAEC CFC | EAKR | |
| Cumberland Valley Rural Electric Cooperative Corp. | Gray, Ky. | D | NRECA, KAEC CFC | EAKR | |
| EAKR -- East Kentucky Power Cooperative, Inc. | Winchester, Ky. | G | NRECA, CFC, KAEC, ECAR[5] | | Supplies power to 18 Kentucky cooperatives. |
| Farmers Rural Electric Cooperative Corp. | Glasgow, Ky. | D | NRECA, KAEC CFC | EAKR | |
| Fleming-Mason Rural Electric Cooperative Corp. | Flemingsburg, Ky. | D | NRECA, KAEC CFC | EAKR | |
| Fox Creek Rural Electric Cooperative Corp. | Lawrenceburg, Ky, | D | NRECA, KAEC CFC | EAKR | |
| Grayson Rural Electric Cooperative Corp. | Grayson, Ky. | D | NRECA, KAEC CFC | EAKR | |
| Green River Electric Corp. | Owensboro, Ky. | D | NRECA, KAEC CFC | BIRI | |

| COOPERATIVE NAME | LOCATION | TYPE | AFFILIATION | WHOLESALE POWER SUPPLIERS | NOTES |
|---|---|---|---|---|---|
| KENTUCKY (cont.) | | | | | |
| Harrison County Rural Electric Cooperative Corp. | Cynthiana, Ky. | D | NRECA, KAEC<br>CFC | EAKR | |
| Henderson-Union Rural Electric Cooperative Corp. | Henderson, Ky. | D | NRECA, KAEC<br>CFC | BIRI | |
| Hickman-Fulton Counties Rural Electric Cooperative Corp. | Hickman, Ky. | D | NRECA, KAEC<br>CFC | TEVA | |
| Inter-County Rural Electric Cooperative Corp. | Danville, Ky. | D | NRECA, KAEC<br>CFC | EAKR | |
| Jackson County Rural Electric Cooperative Corp. | McKee, Ky. | D | NRECA, KAEC<br>CFC | EAKR | |
| Jackson Purchase Electric Cooperative Corp. | Paducah, Ky. | D | NRECA, KAEC<br>CFC | KEUC | |
| Licking Valley Rural Electric Cooperative Corp. | West Liberty, Ky. | D | NRECA, KAEC<br>CFC | EAKR | |
| Meade County Rural Electric Cooperative Corp. | Brandenburg, Ky. | D | NRECA, KAEC<br>CFC | BIRI | |
| Nolin Rural Electric Cooperative Corp. | Elizabethtown, Ky. | D | NRECA, KAEC<br>CFC | EAKR | |
| Owen County Rural Electric Cooperative Corp. | Owenton, Ky. | D | NRECA, KAEC<br>CFC | EAKR | |
| Pennyrile Rural Electric Cooperative Corp. | Hopkinsville, Ky. | D | NRECA | TEVA | |
| Salt River Rural Electric Cooperative Corp. | Bardstown, Ky. | D | | EAKR | |
| Shelby Rural Electric Cooperative Corporation | Shelbyville, Ky. | D | NRECA, KAEC<br>CFC | EAKR | |
| South Kentucky Rural Electric Cooperative Corp. | Somerset, Ky. | D | NRECA, KAEC<br>CFC | EAKR | |
| Taylor County Rural Electric Cooperative Corp. | Campbellsville, Ky. | D | | EAKR | |
| United Utility Supply Co-op | Louisville, Ky. | | NRECA, KAEC<br>CFC | | |
| Warren Rural Electric Cooperative Corp. | Bowling Green, Ky. | D | NRECA, KAEC<br>CFC | TEVA | |
| West Kentucky Rural Cooperative Corporation | Mayfield, Ky. | D | NRECA, CFC | TEVA | |
| Kentucky Association of Electric Cooperatives | Louisville, Ky. | A | NRECA | | |
| OHIO | | | | | |
| Adams Rural Electric Cooperative, Inc. | West Union, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Belmont Electric Cooperative, Inc. | St. Clairsville, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| BUPI -- Buckeye Power, Inc. | Columbus, Oh. | D | NRECA, OREC<br>ECAR[5] | OHPC | Distributes power to all Ohio cooperatives and one Michigan cooperative. |
| Buckeye Rural Electric Cooperative, Inc. | Gallipolis, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Butler Rural Electric Cooperative, Inc. | Hamilton, Oh. | D | NRECA, OREC<br>CFC | BUPI | |

| COOPERATIVE NAME | LOCATION | TYPE | AFFILIATION | WHOLESALE POWER SUPPLIERS | NOTES |
|---|---|---|---|---|---|
| OHIO (cont.) | | | | | |
| Carroll Electric Cooperative, Inc. | Carrollton, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Darke Rural Electric Cooperative, Inc. | Greenville, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Delaware Rural Electric Cooperative, Inc. | Delaware, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Firelands Electric Cooperative, Inc. | New London, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| The Frontier Power Co. | Coshocton, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Guernsey-Muskingum Electric Cooperative Inc. | New Concord, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Hancock-Wood Electric Cooperative, Inc. | North Baltimore, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Holmes-Wayne Electric Cooperative, Inc. | Millersburg, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Licking Rural Electrification, Inc. | Utica, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Logan County Cooperative Power | Bellefontaine, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Lorain-Medina Rural Electric Cooperatives, Inc. | Wellington, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Marion Rural Electric Cooperative, Inc. | Marion, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Midwest Electric, Inc. | St. Marys, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Morrow Electric Cooperative, Inc. | Mt. Gilead, Oh. | D | NRECA, OREC | BUPI | |
| North Central Electric Cooperative, Inc. | Attica, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| North Western Electric Cooperative, Inc. | Bryan, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Paulding-Putnam Electric Cooperative, Inc. | Paulding, Oh. | D | NRECA, OREC<br>CFC | BUPI<br>INME | |
| Pioneer Rural Electric Cooperative, Inc. | Piqua, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| South Central Power Co. | Lancaster, Oh. | D | NRECA, OREC | BUPI | |
| Tricounty Rural Electric Cooperative, Inc. | Napoleon, Oh. | D | NRECA, OREC | BUPI | |
| Union Rural Electric Cooperative, Inc. | Marysville, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| United Rural Electric Cooperative, Inc. | Kenton, Oh. | D | OREC | BUPI | |
| Washington Electric Cooperative, Inc. | Marietta, Oh. | D | NRECA, OREC<br>CFC | BUPI | |
| Ohio Rural Electric Cooperative, Inc. | Columbus, Oh. | A | NRECA | BUPI | |

| COOPERATIVE NAME | LOCATION | TYPE | AFFILIATION | WHOLESALE POWER SUPPLIERS | NOTES |
|---|---|---|---|---|---|
| **PENNSYLVANIA** | | | | | |
| Adams Electric Cooperative, Inc. | Gettysburg, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| AECI -- Allegheny Electric Cooperative, Inc. | Harrisburg, Pa. | G | NRECA, CFC,<br>PREA, MAAC[5] | JECP<br>MEEC<br>PEEC<br>POAS<br>WEPP | A federation of all Pennsylvania borrowers, and one New Jersey cooperative; Allegheny is responsible for members power supply; owns 10% of the planned Susquehana nuclear station. |
| Bedford Rural Electric Cooperative, Inc. | Bedford. Pa. | D | NRECA, PREA<br>CFC | AECI | |
| Central Electric Cooperative, Inc. | Parker, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| Claverack Rural Electric Cooperative, Inc. | Towanda, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| New Enterprise Rural Electric Co-op, Inc. | New Enterprise, Pa. | D | | AECI | |
| The Northwestern Rural Electric Cooperative Association, Inc. | Cambridge Springs, P | D | NRECA, PREA<br>CFC | AECI | |
| Sommerset Rural Electric Cooperative, Inc. | Somerset, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| Southwest Central Rural Electric Cooperative Corp. | Indiana, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| Sullivan County Rural Electric Cooperative, Inc. | Forksville, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| Tri-County Rural Electric Cooperative, Inc. | Mansfield, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| United Electric Cooperative, Inc. | DuBois, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| Valley Rural Electric Cooperative, Inc. | Huntingdon, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| Warren Electric Cooperative, Inc. | Youngsville, Pa. | D | NRECA, PREA<br>CFC | AECI | |
| Pennsylvania Rural Electric Association | Harrisburg, Pa. | A | NRECA | | |
| **WEST VIRGINIA** | | | | | |
| Harrison Rural Electrification Association, Inc, | Clarksburg, W. Va. | D | NRECA, OREC<br>CFC | MOPC | Associate member of OREC. |

SOURCES: National Rural Electric Cooperative Association, "Directory of Rural Electric Systems" in Rural Electrification 37 no. 10, (July, 1978) p.32

U.S. Department of Agriculture, Rural Electrification Admistration, 38th Annual Report of Energy Purchased by REA Borrowers, Calendar Year 1976, REA Bulletin 111-2

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[1] A four letter code is given only to those cooperatives capable of generating power; the codes are the same as those listed in the Electric Generating Unit Inventory. Distribution cooperatives are not identified in this way.

[2] Towns and cities listed are the places where each cooperative maintains a mailing address. The actual service area, however, frequently includes several surrounding counties.

[3] Indicates whether the REC is a distributing cooperative (D), a generating and transmission cooperative (G), or and umbrella organization representing most cooperatives in the state (A).

[4] Supplers are listed regardless of type of sale involved--firm, standby, economy, emergency, etc.

[5] Associate or liaison member of the reliability council; does not have a significant effect on overall reliability

# APPENDIX E

# SELECTED OPERATING STATISTICS FOR MAJOR INVESTOR-OWNED UTILITIES IN THE SIX ORBES STATES

Unless otherwise noted, the following sources provided the data reported in this Appendix:

"Operation Statistics" from the individual Company's Annual Report, 1976

"Additional Ratios" from Moody's Investor Sources, Moody's Public Utility Manual (New York, 1977)

In addition, Data on utility ratings were obtained from Standard and Poor's Corporation, Standard and Poor's Bond Guide (New York, 1977)

# TABLE E-1: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

| UTILITY NAME | ALLEGHENY POWER SYSTEMS | MONONGAHELA POWER CO. | POTOMAC EDISON CO[a] | WEST PENN. POWER CO. |
|---|---|---|---|---|
| | | ALLEGHENY POWER SYSTEMS | | |
| UTILITY CODE | APSI | MPC | POEC | WEPP |
| OPERATING STATISTICS | | | | |
| CUSTOMERS | | | | |
| Residential | 928,298 | 250,454 | 230,325 | 444,569 |
| Total Commercial & Industrial | 109,711 | 29,470 | 29,770 | 49,892 |
| Commercial | 94,668 | 25,247 | | 42,112 |
| Industrial | 15,043 | 4,223 | | 7,780 |
| Other | 746 | 204 | 407 | 454 |
| TOTAL CUSTOMERS | 1,038,755 | 280,128 | 260,502 | 494,915 |
| SALES (Mwh) | | | | |
| Residential | 7,523,000 | 1,660,878 | 2,391,158 | 3,471,481 |
| Total Commercial & Industrial | 18,386,000 | 4,986,194 | 5,247,518 | 8,136,331 |
| Commercial | 4,026,000 | 998,195 | | 1,949,817 |
| Industrial | 14,360,000 | 3,987,999 | | 6,186,514 |
| Other | 3,552,000 | 979,674 | 1,176,804 | 1,425,999 |
| TOTAL SALES | 29,461,000 | 7,626,746 | 8,815,480 | 13,033,811 |
| REVENUES (dollars) | | | | |
| Residential | $259,559,000 | $ 64,751,000 | $ 81,349,209 | $113,459,000 |
| Total Commercial & Industrial | 397,347,000 | 123,674,000 | 105,829,561 | 167,844,000 |
| Commercial | 124,335,000 | 36,038,000 | | 53,165,000 |
| Industrial | 273,012,000 | 87,636,000 | | 114,679,000 |
| Other | 68,368,000 | 28,220,000 | 20,403,329 | 35,602,000 |
| TOTAL REVENUES | $725,274,000 | $216,645,000[b] | $207,582,099 | $316,905,000 |
| GENERATION (Mwh) | | | | |
| Generated | 36,596,000 | 10,380,407 | 8,362,244 | 17,853,529 |
| Total purchased & interchanged | (4,844,000) | (2,161,491) | 1,145,837 | (3,797,592) |
| Purchased | | | | |
| Interchanged | | | | |
| TOTAL GENERATION | 29,461,000[c] | 7.626,746[d] | 9,508,081 | 13,033,811[e] |
| ADDITIONAL RATIOS | | | | |
| FUEL COST -- % OF REVENUES | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| LABOR COST — % OF REVENUES | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| HEAT RATE (Btu/Kwh) | | - | - | - |
| 1971 | 10,511[f] | | | |
| 1972 | 10,154 | | | |
| 1973 | 10,098 | | | |
| 1974 | 10,146 | | | |
| 1975 | 10,017 | | | |
| 1976 | 9,808 | | | |
| FUEL (average cost/ton) | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| FUEL (average cost/$10^6$Btu) | | - | - | - |
| 1971 | $0.2760[f] | | | |
| 1972 | $0.3083 | | | |
| 1973 | $0.3441 | | | |
| 1974 | $0.6869 | | | |
| 1975 | $0.9738 | | | |
| 1976 | $0.9694 | | | |
| EMPLOYEES/$1 MILLION REVENUE | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |

## Notes: Table E-1

[a] All information for this company taken from *Moody's Public Utility Manual*, 1976

[b] Includes $33,554,000 of revenues subject to refund

[c] Includes (2,291,000 mwh) as losses and system uses

[d] Includes (592,170 mwh) as losses and system uses

[e] Includes (1,002,126 mwh) as losses and system uses

[f] This data taken from Utility's annual report for year 1976

## TABLE E-2: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

| UTILITY NAME | AMERICAN ELECTRIC POWER SYSTEM[a] | AMERICAN ELECTRIC POWER SYSTEM<br>APPALACHIAN POWER CO | AMERICAN ELECTRIC POWER SYSTEM<br>INDIANA & MICHIGAN ELECTRIC CO.[b] | AMERICAN ELECTRIC POWER SYSTEM<br>KENTUCKY POWER CO. |
|---|---|---|---|---|
| UTILITY CODE | AEPS | APPC | IMME | KEPC |
| OPERATING STATISTICS | | | | |
| CUSTOMERS | | | | |
| Residential | 1,699,800 | 600,252 | 381,448 | 112,540 |
| Total Commercial & Industrial | 209,436 | 69,254 | 44,155 | 15,777 |
| Commercial | | 66,225 | 41,703 | |
| Industrial | | 3,029 | 2,452 | |
| Other | 8,584 | 3,225 | 1,377 | 156 |
| TOTAL CUSTOMERS | 1,917,820 | 672,731 | 426,980 | 128,473 |
| SALES (Mwh) | | | | |
| Residential | 16,639,000 | 5,856,000 | 3,961,000 | 1,118,000 |
| Total Commercial & Industrial | 40,026,000 | 10,735,000 | 6,787,000 | 2,044,000 |
| Commercial | | 2,874,000 | 2,578,000 | 462,000 |
| Industrial | | 7,861,000 | 4,209,000 | 1,587,000 |
| Other | 28,249,000 | 9,446,000 | 9,299,000 | 997,000 |
| TOTAL SALES | 84,913,000 | 26,037,000 | 20,047,000 | 4,159,000 |
| REVENUES (dollars) | | | | |
| Residential | $ 490,450,000 | $181,004,000 | $109,335,000 | $27,403,000 |
| Total Commercial & Industrial | 847,136,000 | 259,206,000 | 152,760,000 | 38,629,000 |
| Commercial | | 90,895,000 | 72,527,000 | 11,949,000 |
| Industrial | | 168,311,000 | 80,233,000 | 26,680,000 |
| Other | 479,723,000 | 169,974,000[c] | 155,453,000[d] | 18,208,000[e] |
| TOTAL REVENUES | $1,817,309,000 | $610,184,000 | $417,548,000 | $84,240,000 |
| GENERATION (Mwh) | | | | |
| Generated | 90,222,000 | 22,410,000 | 14,582,000[f] | 6,432,000 |
| Total purchased & Interchanged | 1,106,748 | 5,912,000 | 6,755,000 | (2,123,000) |
| Purchased | 1,107,000 | 431,000 | 232,000 | 11,000 |
| Interchanged | (252) | 5,481,000 | 6,523,000 | (2,134,000) |
| TOTAL GENERATION | 91,328,748 | 28,322,000 | 21,337,000 | 4,309,000 |
| ADDITIONAL RATIOS | | | | |
| FUEL COST -- % OF REVENUES | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| LABOR COST -- % OF REVENUES | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| HEAT RATE (Btu/Kwh) | - | | | |
| 1971 | | 9,220[g] | 9,673[g] | 9,476[g] |
| 1972 | | 9,288 | 9,506 | 9,544 |
| 1973 | | 9,474 | 9,538 | 9,371 |
| 1974 | | 9,441 | 10,063 | 9,480 |
| 1975 | | 9,489 | 10,190 | 9,502 |
| 1976 | | | | |
| FUEL (average cost/ton) | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| FUEL (average cost/$10^6$Btu) | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| EMPLOYEES/$1 MILLION REVENUE | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |

Notes: Table E-2

[a] All information for this company from Moody's Public Utility Manual, 1976. This description of American Electric Power Company consolidates data for the following companies: Appalachian Power Co., Indiana & Michigan Electric Co., Kentucky Power Co., Kingsport Power Co. (not in ORBES states), Michigan Power Co. (Not in ORBES states), Ohio Power Co., Wheeling Electric Co. (a non-generating company), Ohio Valley Electric Company (37.8% Ownership). The major companies in this system are shown separately.

[b] Includes information on Indiana and Michigan Electric Company's subsidiary, Indiana and Michigan Power Company

[c] Includes $165,386,000 from other kwh sales, ($3,553,000) of unallocated revenue, and $8,141,000 from other operating revenue

[d] Includes $154,086,000 from other kwh sales, ($2,444,000) of unallocated revenue, and $3,811,000 from other operating revenues

[e] Includes $17,463,000 from other kwh sales and $745,000 from other operating revenues.

[f] Includes 7,700,000 mwh of steam-fossil and 6,809,000 mwh steam-nuclear and 73,000 mwh of hydro

[g] Data taken from Company's annual report, year ending December 31, 1976

# TABLE E-3: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

| UTILITY NAME | AEPS (Cont.)<br>OHIO POWER CO. | GENERAL PUBLIC UTILITIES[a] | GENERAL PUBLIC UTILITIES<br>METROPOLITAN EDISON CO.[b] | PENNSYLVANIA ELECTRIC CO.[c] |
|---|---|---|---|---|
| UTILITY CODE | OHPC | GPU | MEEC | PEEC |
| OPERATING STATISTICS | | | | |
| CUSTOMERS | | | | |
| Residential | 514,461 | 1,320,400 | 297,167[d] | 431,224 |
| Total Commercial & Industrial | 69,196 | 158,736 | 36,960[d] | 56,346 |
| Commercial | | 149,062 | | |
| Industrial | | 9,674 | | |
| Other | 3,442 | 4,072 | 2,544[d] | 633 |
| TOTAL CUSTOMERS | 587,099 | 1,483,208 | 336,671[d] | 488,203 |
| SALES (Mwh) | | | | |
| Residential | 4,725,500 | 19,931,704 | 2,268,000 | 2,935,000 |
| Total Commercial & Industrial | 18,295,379 | 16,959,645 | 4,145,000 | 6,419,000 |
| Commercial | | 6,482,950 | 1,351,000 | 2,079,000 |
| Industrial | | 10,476,695 | 2,794,000 | 4,340,000 |
| Other | 11,935,390 | 1,745,631 | 675,000 | 705,000 |
| TOTAL SALES | 34,956,269 | 28,636,980 | 7,089,000 | 10,059,000 |
| REVENUES (dollars) | | | | |
| Residential | $147,077,642 | $444,264,430 | $101,367,000 | $120,292,000 |
| Total Commercial & Industrial | 348,636,766 | | 134,402,000 | 186,552,000 |
| Commercial | | 263,423,273 | 55,693,000 | 79,120,000 |
| Industrial | | 285,056,374 | 78,709,000 | 107,432,000 |
| Other | 217,032,666 | 73,451,679 | 27,754,000[e] | 31,074,000[f] |
| TOTAL REVENUES | $712,747,074 | $1,066,175,756 | $263,503,000 | $337,918,000 |
| GENERATION (Mwh) | | | | |
| Generated | 46,785,547 | 26,212,963 | | |
| Total purchased & interchanged | (9,687,836) | 5,489,312 | | |
| Purchased | | 1,932,818 | | |
| Interchanged | | 3,556,494 | | |
| TOTAL GENERATION | 37,097,711 | 31,702,275 | 7,294,004[g] | 10,164,765[h] |
| ADDITIONAL RATIOS | | | | |
| FUEL COST — % OF REVENUES | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| LABOR COST — % OF REVENUES | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| HEAT RATE (Btu/Kwh) | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| FUEL (average cost/ton) | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| FUEL (average cost/$10^6$ Btu) | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |
| EMPLOYEES/$ 1 MILLION REVENUE | - | - | - | - |
| 1971 | | | | |
| 1972 | | | | |
| 1973 | | | | |
| 1974 | | | | |
| 1975 | | | | |
| 1976 | | | | |

Notes: Table E-3

[a] Data, taken from Moody's Public Utility Manual, 1976, includes information on all three GPU subsidiaries

[b] Includes data of Metropolitan Edison Company's subsidiary, York Haven Power Company

[c] Includes data on Pennsylvania Electric Company's subsidiary Waverly Electric Light and Power Company

[d] Data taken from Moody's Public Utility Manual, 1976

[e] Includes $21,980,000 of revenue from other Kwh sales and $5,774,000 of revenue from other sources

[f] Includes $20,415,000 of revenue from other Kwh sales and $10,659,000 of revenue from other sources

[g] Data, taken from Moody's Public Utility Manual, 1976 refers only to Mwh generated, including 4,859,844 MWh from steam, 2,167,813 Mwh from Nuclear, and 266,346 Mwh of hydro and other sources; no purchased or interchanged power is included.

[h] Data, taken from Moody's Public Utility Manual, 1976, refers only to Mwh generated, including 8,968,061 MWh from steam, 1,083 Mwh from nuclear and 1,195,621 Mwh from other sources; no purchased or interchanged power is included.

# TABLE E-4: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

|  | ILLINOIS |  |  |  |
|---|---|---|---|---|
| UTILITY NAME | CENTRAL ILLINOIS LIGHT CO.[a] | CENTRAL ILLINOIS PUBLIC SERVICE CO.[a] | COMMONWEALTH EDISON CO. | ILLINOIS POWER CO.[a] |
| UTILITY CODE | CEIL | CEIP | COEC | ILPC |
| OPERATING STATISTICS |  |  |  |  |
| CUSTOMERS |  |  |  |  |
| Residential | 152,636[b] | 252,185 | 2,557,466[b] | 435,611 |
| Total Commercial & Industrial | 18,7[illegible][b] | 38,862 | 222,799[b] | 52,359 |
| Commercial |  | 36,320[c] |  | 51,019[d] |
| Industrial |  | 2,542[c] |  | 1,340[d] |
| Other | 252[b] | 787 | 10,763[b] | 694 |
| TOTAL CUSTOMERS | 171,670[b] | 291,834 | 2,791,028[b] | 488,664 |
| SALES (Mwh) |  |  |  |  |
| Residential | 1,259,344[b] | 1,981,804 | 16,114,000 | 3,271,719 |
| Total Commercial & Industrial | 2,872,795[b] | 3,975,157 | 35,088,000 | 7,818,037 |
| Commercial |  | 792,337[c] | 17,433,000[f] | 1,405,389[d] |
| Industrial |  | 3,182,820[c] | 17,655,000[f] | 6,412,648[d] |
| Other | 91,149[b] | 1,802,864[e] | 7,135,000[g] | 985,968[h] |
| TOTAL SALES | 4,223,288[b] | 7,759,825 | 58,337,000 | 12,075,724 |
| REVENUES (dollars) |  |  |  |  |
| Residential | $52,341,000 | $80,146,000 | $652,312,000 | $108,932,000 |
| Total Commercial & Industrial | 89,326,000 | 120,756,000 | 1,064,653,000 | 175,433,000 |
| Commercial | 39,349,000 | 36,611,000[c] | 656,062,000 | 53,698,000[d] |
| Industrial | 49,977,000 | 84,145,000[c] | 408,591,000 | 121,735,000[d] |
| Other | 3,060,000[i] | 41,226,000[j] | 191,223,000[k] | 18,701,000[l] |
| TOTAL REVENUES | $144,727,000 | $242,128,000 | $1,908,188,000 | $303,066,000 |
| GENERATION (Mwh) |  |  |  |  |
| Generated | 4,548,000[b] | 7,716,000 | 60,717,072[b] | 15,744,228 |
| Total purchased & interchanged | (6,074)[b] |  | 2,557,056[b] | (2,707,988) |
| Purchased | 388[b] |  |  |  |
| Interchanged | (6,462)[b] | 713,000 |  |  |
| TOTAL GENERATION | 4,541,926 | 8,429,000 | 63,274,128[b] | 12,075,724[m] |
| ADDITIONAL RATIOS |  |  |  |  |
| FUEL COST -- % OF REVENUES |  |  |  |  |
| 1971 | 12.4 | - | 21.5 | 13.0 |
| 1972 | 14.8 |  | 21.1 | 12.6 |
| 1973 | 17.7 |  | 21.8 | 14.1 |
| 1974 | 19.7 |  | 25.0 | 19.1 |
| 1975 | 22.1 |  | 23.9 | 21.7 |
| 1976 | 22.2 |  | 2[illegible].6 | 26.8 |
| LABOR COST -- % OF REVENUES |  |  |  |  |
| 1971 | 9.8 | - | 19.5 | 11.9 |
| 1972 | 9.6 |  | 18.9 | 11.6 |
| 1973 | 9.4 |  | 18.3 | 11.9 |
| 1974 | 8.7 |  | 17.0 | 11.7 |
| 1975 | 8.4 |  | 15.7 | 10.6 |
| 1976 | 6.8 |  | 15.3 | 10.4 |
| HEAT RATE (Btu/Kwh) |  |  |  |  |
| 1971 | 10,614 | - | 10,933 | 10,328 |
| 1972 | 10,805 |  | 10,942 | 10,309 |
| 1973 | 10,356 |  | 10,934 | 10,257 |
| 1974 | 10,275 |  | 11,113 | 10,193 |
| 1975 | 10,414 |  | 11,069 | 10,040 |
| 1976 | 10,715 |  | 11,094 | 10,041 |
| FUEL (average cost/ton) |  |  |  |  |
| 1971 | $6.316 | - | $8.02 | $5.27 |
| 1972 | 7.051 |  | 8.14 | 5.86 |
| 1973 | 8.757 |  | 8.35 | 6.25 |
| 1974 | 12.380 |  | 11.00 | 8.52 |
| 1975 | 16.813 |  | 12.20 | 11.88 |
| 1976 | 19.991 |  | 13.90 | 15.04 |
| FUEL (average cost/$10^6$ Btu) |  |  |  |  |
| 1971 | $0.30 | - | $0.40 | $0.27 |
| 1972 | 0.34 |  | 0.41 | 0.33 |
| 1973 | 0.42 |  | 0.42 | 0.34 |
| 1974 | 0.60 |  | 0.56 | 0.49 |
| 1975 | 0.88 |  | 0.63 | 0.65 |
| 1976 | 1.042 |  | 0.72 | 0.78 |
| EMPLOYEES/$ 1 MILLION REVENUE |  |  |  |  |
| 1971 | 14.7 | - | 14.8 | 13.70 |
| 1972 | 13.3 |  | 13.0 | 12.46 |
| 1973 | 12.7 |  | 11.9 | 11.67 |
| 1974 | 11.2 |  | 10.2 | 10.20 |
| 1975 | 9.0 |  | 8.6 | 8.24 |
| 1976 | 7.1 |  | 7.9 | 7.44 |

Notes: Table E-4

[a] Although company distributes both natural gas and electric energy the figures given refer only to electric utility operation

[b] Data, taken from Moody's Public Utility Manual

[c] Figures given for "commercial" use correspond to "small light and power" and "industrial" corresponds to "large light and power" in Central Illinois Public Service's annual report

[d] Figures shown as "commercial" use correspond to "commercial and small power" in Illinois Power Company's annual report while "Industrial" use corresponds to "large power and light"

[e] Includes 1,323,247 Mwh sales to cooperatives and 479,617 Mwh sales to municipal and other customers

[f] The commercial designation in this case includes small commercial and industrial establishment. The industrial designation refers to large commercial and industrial establishments. These categories are not defined further

[g] Includes 5,345,000 Mwh of sales to public authorities, 334,000 Mwh sales to electric railroads, and 1,456,000 Mwh sales for resale

[h] Includes 736,834,000 Mwh of sales to rural cooperatives and municipal utilities, 1,836 Mwh sales to other electric utilities, and 247,298 Mwh sales to other sources

[i] Includes $1,095,000 from other utilities, $1,479,000 from street lighting and public authorities, and $486,000 of other revenues

[j] Includes $28,924,000 in revenues from cooperatives and $12,302,000 in revenues from municipals and other customers

[k] Includes $141,066,000 of revenue from public authorities, $7,615,000 of revenue from electric railroads. $27,743,000 of revenue from sales for resale, and $14,799,000 from other revenues

[l] Includes $10,920,000 of revenue from rural cooperatives and municipal utilities $5,170,000 from other ultimate consumers, $39,000 from other electric utilities, and $2,572,000 from miscellaneous sources

[m] Includes (960,516 Mwh) of lost and unaccounted for power

## TABLE E-5: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

| | ILLINOIS (Cont.) | | INDIANA | |
|---|---|---|---|---|
| UTILITY NAME | IOWA-ILLINOIS GAS & ELECTRIC CO.$^a$ | UNION ELECTRIC CO.$^a$ | INDIANAPOLIS POWER & LIGHT CO. | NORTHERN INDIANA PUBLIC SERVICE CO. |
| UTILITY CODE | IOIG | UNEC | INPL | NOIP |
| OPERATING STATISTICS | | | | |
| CUSTOMERS | | | | |
| Residential | 140,915$^b$ | 821,564 | 276,412 | 307,396 |
| Total Commercial & Industrial | 17,712$^b$ | 100,707 | 32,148 | 36,981 |
| Commercial | | 96,233 | 31,124$^d$ | 28,449 |
| Industrial | | 4,474 | 1,024$^d$ | 8,532 |
| Other | 54$^b$ | 1,496$^c$ | 136$^e$ | 694 |
| TOTAL CUSTOMERS | 158,681$^b$ | 923,767 | 308,696 | 345,071 |
| SALES (Mwh) | | | | |
| Residential | 859,872$^b$ | 6,625,000 | 2,370,802 | 2,088,981 |
| Total Commercial & Industrial | 2,400,000$^b$ | 13,044,000 | 5,402,675 | 9,579,287 |
| Commercial | | 2,467,000 | 1,636,176$^d$ | 528,758 |
| Industrial | | 10,577,000 | 3,766,499$^d$ | 9,050,529 |
| Other | 179,217$^b$ | 1,690,000$^f$ | 132,928$^g$ | 904,132$^h$ |
| TOTAL SALES | 3,439,089$^b$ | 21,359,000 | 7,906,405 | 12,572,400 |
| REVENUES (dollars) | | | | |
| Residential | | $248,784,000 | $62,086,000 | $78,689,000 |
| Total Commercial & Industrial | | 350,107,000 | 115,813,000 | 223,380,000 |
| Commercial | | 110,400,000 | 46,791,000$^d$ | 23,950,000 |
| Industrial | | 239,707,000 | 69,022,000$^d$ | 199,430,000 |
| Other | | 36,109,000$^i$ | 6,156,000$^j$ | 21,313,000$^k$ |
| TOTAL REVENUES | $99,974,000 | $635,000,000 | $184,055,000 | $323,382,000 |
| GENERATION (Mwh) | | | | |
| Generated | 4,040,985$^b$ | 24,803,000 | 8,980,000 | 8,659,761$^a$ |
| Total purchased & interchanged | | (1,498,000) | | 4,492,363$^a$ |
| Purchased | 77,219$^b$ | | (574,000) | |
| Interchanged | | | | |
| TOTAL GENERATION | | 23,305,000$^l$ | 8,406,000 | 13,152,324$^a$ |
| ADDITIONAL RATIOS | | | | |
| FUEL COST — % OF REVENUES | | | | |
| 1971 | 20.29 | 16.6 | 19.3 | 7.4 |
| 1972 | 20.29 | 17.6 | 18.9 | 7.2 |
| 1973 | 22.10 | 19.4 | 22.3 | 7.3 |
| 1974 | 25.92 | 22.5 | 28.3 | 10.0 |
| 1975 | 25.36 | 27.1 | 34.1 | 13.0 |
| 1976 | - | 29.6 | 35.0 | 11.1 |
| LABOR COST — % OF REVENUES | | | | |
| 1971 | 12.56 | | 12.7 | 12.8 |
| 1972 | 9.87 | | 12.2 | 12.1 |
| 1973 | 9.97 | | 12.7 | 11.2 |
| 1974 | 9.66 | | 13.6 | 12.8 |
| 1975 | 8.45 | | 12.1 | 13.0 |
| 1976 | 8.38 | | 12.2 | 10.5 |
| HEAT RATE (Btu/Kwh) | | | | |
| 1971 | 12,399 | 10,987 | 10,300 | 10,204 |
| 1972 | 11,949 | 10,889 | 10,121 | 10,244 |
| 1973 | 11,275 | 10,387 | 10,358 | 10,330 |
| 1974 | 11,762 | 10,289 | 10,213 | 10,519 |
| 1975 | 11,955 | 10,202 | 10,349 | 10,382 |
| 1976 | 11,457 | 10,393 | 10,403 | 10,329 |
| FUEL (average cost/ton) | | | | |
| 1971 | $8.46 | $6.42 | $5.94 | $7.41 |
| 1972 | 8.37 | 7.53 | 6.76 | 7.87 |
| 1973 | 10.65 | 8.05 | 7.54 | 8.31 |
| 1974 | 16.11 | 10.41 | 9.31 | 11.31 |
| 1975 | 19.45 | 13.31 | 13.47 | 15.55 |
| 1976 | 17.33 | 15.29 | 14.68 | 16.29 |
| FUEL (average cost/$10^6$ Btu) | | | | |
| 1971 | $0.38 | $0.30 | $0.269 | $0.342 |
| 1972 | 0.35 | 0.34 | 0.305 | 0.367 |
| 1973 | 0.32 | 0.37 | 0.342 | 0.387 |
| 1974 | 0.46 | 0.50 | 0.428 | 0.539 |
| 1975 | 0.61 | 0.63 | 0.62[illegible] | 0.758 |
| 1976 | 0.59 | 0.71 | 0.675 | 0.806 |
| EMPLOYEES/$ 1 MILLION REVENUE | | | | |
| 1971 | 13.7 | 17.1 | 18.0 | 16.0 |
| 1972 | 11.1 | 15.6 | 16.3 | 14.3 |
| 1973 | 10.3 | 19.8 | 15.6 | 14.4 |
| 1974 | 9.3 | 13.3 | 15.0 | 12.5 |
| 1975 | 7.2 | 10.4 | 11.7 | 10.3 |
| 1976 | 6.5 | 8.9 | 10.5 | 8.7 |

## Notes: Table E-5

[a] Although company distributes both natural gas and electric energy, the figures given refer only to the electric utility operations

[b] Data, taken from Moody's Public Utility Manual - 1976

[c] Includes 24 electric utilities and 1,472 other

[d] Figures given for "commercial" corresponds to "small industrial and commercial; "industrial" use corresponds to "large industrial and commercial"

[e] Includes 134 customers for public lighting and 2 electric utilities

[f] Includes 1,171,000 Mwh in sales to other utilities and 519,000 Mwh in miscellaneous sales

[g] Includes 55,020 Mwh sales for public lighting and 77,908 Mwh sales to other electric utilities

[h] Includes 77,591 Mwh sales for street lighting, 716,051 Mwh sales for resale, and 110,490 Mwh sales for other uses

[i] Includes $21,432,000 from other electric utilities and $14,677 from miscellaneous sources

[j] Includes $3,153,000 in public lighting revenues, $1,183,000 from other electric utilities, and $1,820,000 in miscellaneous revenues

[k] Includes $3,122,000 from street lighting, $14,539,000 from sales for resale, and $3,652,000 from other sources

[l] Includes (1,946,000 Mwh) of losses and other uses

# TABLE E-6: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

| | INDIANA (cont.) | | KENTUCKY | |
|---|---|---|---|---|
| | PUBLIC SERVICE COMPANY OF INDIANA | SOUTHERN INDIANA GAS & ELECTRIC CO.[a] | KENTUCKY UTILITIES CO.[b] | LOUISVILLE GAS & ELECTRIC CO.[a] |
| UTILITY CODE | PSIN | SOIG | KEUC | LGCE |
| OPERATING STATISTICS | | | | |
| CUSTOMERS | | | | |
| Residential | 435,512 | 82,868 | 281,599[d] | 253,745[d] |
| Total Commercial & Industrial | 61,820 | 10,465 | 43,661[d] | 26,626 |
| Commercial | 59,359 | 10,261 | | |
| Industrial | 2,461 | 204 | | |
| Other | 988[c] | 24 | 5,521[d] | 2,969[d] |
| TOTAL CUSTOMERS | 498,320 | 93,357 | 330,781[d] | 283,340[d] |
| SALES (MWh) | | | | |
| Residential | 4,136,000 | 717,882 | 2,443,318 | 2,001,944 |
| Total Commercial & Industrial | 8,304,000 | 1,535,641 | 3,125,183 | 4,288,030 |
| Commercial | | 558,361 | | 1,613,162[g] |
| Industrial | | 977,280 | | 2,674,868[h] |
| Other | 3,092,000[e] | 1,203,520 | 5,241,541[f] | 1,292,160[i] |
| TOTAL SALES | 15,532,000 | 3,457,043 | 10,810,042 | 7,582,134 |
| REVENUES (dollars) | | | | |
| Residential | $141,897,000 | $24,177,378 | $68,678,000 | $51,844,000 |
| Total Commercial & Industrial | 195,108,000 | 34,390,797 | 71,457,000 | 80,122,000 |
| Commercial | 90,031,000 | | | 40,008,000[m] |
| Industrial | 105,077,000 | | | 40,114,000[h] |
| Other | 60,737,000[j] | 17,305,636[k] | 89,221,000[l] | 22,361,000[n] |
| TOTAL REVENUES | $397,742,000 | $75,873,811 | $229,356,000 | $154,327,000 |
| GENERATION (MWh) | | | | |
| Generated | 18,698,000 | 2,892,468[d] | 7,819,028 | 8,278,508[q] |
| Total purchased & interchanged | (1,840,000) | 718,981[d] | 3,792,864 | (304,877) |
| Purchased | | 714,890 | 3,671,873 | |
| Interchanged | | 4,091 | 120,991 | |
| TOTAL GENERATION | 16,858,000[o] | 3,611,449[d] | 10,810,042[p] | 7,973,631 |
| ADDITIONAL RATIOS | | | | |
| FUEL COST — % OF REVENUES | | | | |
| 1971 | 17.1 | 9.7 | 17.5 | 11.9 |
| 1972 | 18.5 | 12.8 | 17.5 | 13.6 |
| 1973 | 18.5 | 14.4 | 17.9 | 14.5 |
| 1974 | 21.9 | 17.1 | 27.9 | 15.8 |
| 1975 | 27.1 | 20.0 | 26.3 | 19.1 |
| 1976 | 30.8 | - | 27.1 | 21.3 |
| LABOR COST — % OF REVENUES | | | | |
| 1971 | 18.4 | 14.2 | 11.6 | 14.5 |
| 1972 | 17.2 | 13.4 | 10.8 | 14.0 |
| 1973 | 16.7 | 12.9 | 14.3 | 14.8 |
| 1974 | 17.4 | 12.0 | 12.0 | 14.7 |
| 1975 | 16.6 | 10.9 | 9.7 | 13.6 |
| 1976 | 14.5 | 9.4 | 10.2 | 12.9 |
| HEAT RATE (Btu/Kwh) | | | | |
| 1971 | 10,569 | 11,280 | 11,106 | 10,259 |
| 1972 | 10,444 | 11,414 | 11,119 | 10,190 |
| 1973 | 10,296 | 10,815 | 11,104 | 10,197 |
| 1974 | 10,332 | 10,706 | 10,608 | 9,969 |
| 1975 | 10,214 | 10,531 | 10,679 | 10,004 |
| 1976 | 10,193 | 10,556 | 10,745 | 10,053 |
| FUEL (average cost/ton) | | | | |
| 1971 | $5.59 | $4.68 | $8.32 | $5.87 |
| 1972 | 6.23 | 5.35 | 8.72 | 7.04 |
| 1973 | 6.42 | 5.84 | 9.14 | 7.56 |
| 1974 | 8.28 | 7.04 | 14.59 | 9.35 |
| 1975 | 11.18 | 9.93 | 18.05 | 12.68 |
| 1976 | 14.17 | 11.78 | 16.65 | 13.80 |
| FUEL (average cost/$10^6$ Btu) | | | | |
| 1971 | $0.255 | $0.26 | $0.52 | $0.27 |
| 1972 | 0.288 | 0.31 | 0.84 | 0.32 |
| 1973 | 0.300 | 0.30 | 0.39 | 0.34 |
| 1974 | 0.388 | 0.37 | 0.665 | 0.42 |
| 1975 | 0.521 | 0.50 | 0.82 | 0.57 |
| 1976 | 0.656 | 0.57 | 0.74 | 0.63 |
| EMPLOYEES/$ 1 MILLION REVENUE | | | | |
| 1971 | 17.0 | 14.6 | 17.30 | 22.8 |
| 1972 | 14.9 | 12.8 | 15.97 | 21.4 |
| 1973 | 13.5 | 11.4 | 14.35 | 19.8 |
| 1974 | 13.0 | 10.0 | 10.38 | 18.3 |
| 1975 | 11.5 | 8.3 | 7.57 | 15.1 |
| 1976 | 9.14 | 7.4 | 7.25 | 14.4 |

## Notes: Table E-6

[a] Although the company distributes both natural gas and electric energy, the figures refer only to the electric utility operation

[b] Includes information on Kentucky Utilities Company's wholly owned subsidary, Old Dominion Power Company

[c] Includes 108 rural electric cooperatives (RECs), 44 Municipal customers, and 836 other customers

[d] Data obtained from Moody's Public Utility Manual, 1976

[e] Includes 1,805 Mwh in sales to RECs, 1,204,000 Mwh in sales to muncipal customers and 83,000 Mwh in sales to other customers

[f] Includes 792,720 Mwh sales to mines, 629,405 Mwh sale to public authorities, and 3,819,416 Mwh sales to other electric utilities

[g] "Commercial" includes 669,994 Mwh of sales for "small commercial and industrial" use and 943,168 Mwh of sales for "large commercial" use

[h] "Industrial" refers to large industrial firms

[i] Includes 681,018 Mwh of sales to public authorities and 611,142 Mwh of sales to other utilities

[j] Includes $33,656,000 from RECs, $19,416,000 from muncipal customers, and $7,665,000 from other customers

[k] Includes $2,582,029 from sales for resale, $13,169,390 from sales to other utilities and Alcoa Generating Corporation, and $1,554,217 from sales to other customers

[l] Includes $15,772,000 from sales to mines, $14,477,000 from sales to public authorities, $57,516,000 from sales to other electric utilities, and $1,456,000 from miscellaneous revenues

[m] "Commercial" includes $20,344,000 from "small commercial and industrial" firms and $19,664,000 from "large commercial" firms. "Industrial" refers to large firms.

[n] Includes $13,930,000 from "public authorities", $7,255,000 from "other electric utilities" and $1,176,000 from "miscellaneous sources"

[o] Does not include (1,326,000 Mwh) from company use and losses

[p] Includes (801,850 Mwh) as a result of losses and company use

[q] Includes 447,468 Mwh generated by hydropower; 3,053 Mwh generated by combustion turbine, 188,170 Mwh generated by Ohic Valley Electric Corporation

# TABLE E-7: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

| | OHIO | | | |
|---|---|---|---|---|
| UTILITY NAME | CINCINNATI GAS & ELECTRIC CO.[b] | CLEVELAND ELECTRIC ILLUMINATING CO. | COLUMBUS & SOUTHERN ELECTRIC CO. | DAYTON POWER & LIGHT CO. |
| UTILITY CODE | CIGE | CLEI | COSO | DAPO |
| OPERATING STATISTICS | | | | |
| CUSTOMERS | | | | |
| Residential | 415,643[c] | 630,581 | 388,362[c] | 360,239 |
| Total Commercial & Industrial | 44,603[c] | 62,384 | 41,594[c] | 37,303 |
| Commercial | | 55,178 | | |
| Industrial | | 7,206 | | |
| Other | 2,536[c] | 460 | 1,094[c] | 5,058[d] |
| TOTAL CUSTOMERS | 462,782[c] | 693,425 | 431,050[c] | 402,600 |
| SALES (Mwh) | | | | |
| Residential | 4,068,000 | 4,045,200 | 2,859,023 | 3,211,000 |
| Total Commercial & Industrial | 7,168,000 | 12,284,900 | 4,492,448 | 4,585,000 |
| Commercial | 2,873,000 | 3,808,900 | 2,527,377 | |
| Industrial | 4,295,000 | 8,476,000 | 1,965,071 | |
| Other | 1,193,000 | 1,740,200[e] | 781,897[f] | 1,425,000[g] |
| TOTAL SALES | 12,429,000 | 18,070,300 | 8,133,368 | 9,221,000 |
| REVENUES (dollars) | | | | |
| Residential | $132,093,000 | $160,015,000 | $119,146,000 | $111,833,000 |
| Total Commercial & Industrial | 186,282,000 | 326,475,000 | 140,892,000 | 123,582,000 |
| Commercial | 91,534,000 | 129,286,000 | 87,701,000 | |
| Industrial | 94,748,000 | 197,189,000 | 53,191,000 | |
| Other | 34,044,000 | 45,730,000[h] | 20,247,000[i] | 38,256,000[j] |
| TOTAL REVENUES | $352,419,000 | $532,220,000 | $280,285,000 | $273,671,000 |
| GENERATION (Mwh) | | | | |
| Generated | 13,247,000 | 16,747,626 | 8,646,860 | 9,155,250 |
| Total purchased & interchanged | 189,000 | 1,583,758 | 221,703 | 910,214 |
| Purchased | | | | |
| Interchanged | | | | |
| TOTAL GENERATION | 13,436,000 | 18,331,384 | 8,133,368[k] | 10,065,464 |
| ADDITIONAL RATIOS | | | | |
| FUEL COST -- % OF REVENUES | | | | |
| 1971 | 12.8 | - | 17.8 | 16.1 |
| 1972 | 13.6 | | 19.7 | 15.6 |
| 1973 | 14.9 | | 21.2 | 17.8 |
| 1974 | 21.6 | | 31.9 | 28.0 |
| 1975 | 24.2 | | 30.5 | 26.1 |
| 1976 | 25.0 | | 30.3 | 24.9 |
| LABOR COST -- % OF REVENUES | | | | |
| 1971 | 13.4 | - | 19.2 | 18.2 |
| 1972 | 12.3 | | 18.3 | 17.5 |
| 1973 | 12.1 | | 18.3 | 17.4 |
| 1974 | 10.9 | | 17.1 | 14.1 |
| 1975 | 9.9 | | 14.0 | 12.2 |
| 1976 | 9.6 | | 14.6 | 11.9 |
| HEAT RATE (Btu/Kwh) | | | | |
| 1971 | 10,308 | 10,256 | 10,900 | 10,120 |
| 1972 | 10,178 | 10,172 | 10,585 | 9,953 |
| 1973 | 10,024 | 10,382 | 10,430 | 10,004 |
| 1974 | 10,262 | 10,569 | 10,866 | 10,320 |
| 1975 | 10,183 | 10,454 | 10,675 | 10,090 |
| 1976 | 10,252 | 10,322 | 10,600 | 10,106 |
| FUEL (average cost/ton) | | | | |
| 1971 | $7.58 | $9.03 | $6.38 | $9.86 |
| 1972 | 7.98 | 9.94 | 7.40 | 9.50 |
| 1973 | 8.80 | 11.05 | 8.57 | 10.42 |
| 1974 | 13.57 | 21.53 | 13.02 | 19.83 |
| 1975 | 18.34 | 24.93 | 18.96 | 21.99 |
| 1976 | 20.14 | 23.98 | 19.85 | 21.96 |
| FUEL (average cost/$10^6$ Btu) | | | | |
| 1971 | $0.370 | $0.4051 | $0.32 | $0.43 |
| 1972 | 0.403 | 0.4286 | 0.36 | 0.43 |
| 1973 | 0.443 | 0.4840 | 0.42 | 0.48 |
| 1974 | 0.742 | 1.0226 | 0.67 | 0.97 |
| 1975 | 0.927 | 1.2114 | 0.92 | 1.04 |
| 1976 | 1.009 | 1.0555 | 0.95 | 1.03 |
| EMPLOYEES/$ 1 MILLION REVENUE | | | | |
| 1971 | 16 | - | 22.1 | 16.6 |
| 1972 | 14 | | 19.6 | 15.2 |
| 1973 | 13 | | 18.0 | 13.9 |
| 1974 | 11 | | 14.8 | 10.6 |
| 1975 | 9 | | 10.8 | 8.7 |
| 1976 | 8 | | 10.3 | 7.9 |

## Notes: Table E-7

[a] Although company distributes both natural gas and electric energy, the figures given refer only to electric utility operation

[b] Includes information of Cincinnati Gas and Electric Company's subsidiaries: Union Light, Heat, and Power Company, Miami Power Corporation. The West Harrison Gas and Electric Company, Lawrenceburg Gas Company and Lawrenceberg Gas Transmission Corporation.

[c] Data taken from Moody's Public Utility Manual, 1976

[d] Include 5,042 public authority customers and 16 other customers

[e] Include 1,329,000 Mwh sales to other utilities

[f] Includes 308,688 Mwh sales to governmental authorities and 473,209 Mwh sales for resale

[g] Includes 924,000 Mwh sales to public authorities and 501,000 Mwh other sales

[h] Does not include $10,928,000 of revenue from steam heating operations

[i] Includes $8,541,000 revenue from governmental authorities, $9,583,000 revenue from sales for resale and $2,123,000 from other sales

[j] Includes $24,753,000 from public authorities and $13,503,000 from other sources

[k] Includes (735,195 Mwh) due to losses and company use

# TABLE E-8: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

| | OHIO (Cont.) | | | PENNSYLVANIA |
|---|---|---|---|---|
| | OHIO EDISON COMPANY | | TOLEDO EDISON CO.[b] | DUQUESNE LIGHT CO. |
| UTILITY NAME | OHIO EDISON CO.[a] | PENNSYLVANIA POWER CO. | | |
| UTILITY CODE | OHEC | PEPC | TOEC | DULC |
| OPERATING STATISTICS | | | | |
| CUSTOMERS | | | | |
| Residential | 721,126 | 103,725[c] | 227,167 | 484,301 |
| Total Commercial & Industrial | 74,418 | 12,225 | 26,340 | 48,534 |
| Commercial | 73,442 | 12,090 | 22,912 | 46,652 |
| Industrial | 976 | 135 | 3,428[d] | 1,882 |
| Other | 568 | 113 | | 1,774 |
| TOTAL CUSTOMERS | 796,112 | 116,063 | 253,507 | 534,609 |
| SALES (MWh) | | | | |
| Residential | 5,273,500 | 750,500[c] | 1,782,000 | 2,693,000 |
| Total Commercial & Industrial | 11,447,900 | 2,172,100 | 4,597,000 | 9,694,000 |
| Commercial | 3,890,400 | 467,600 | 1,203,000 | 3,769,000 |
| Industrial | 7,557,500 | 1,704,500 | 3,394,000 | 5,925,000 |
| Other | 1,446,000 | 112,000 | 843,000 | 129,000 |
| TOTAL SALES | 18,167,400 | 3,034,600 | 7,222,000 | 12,516,000 |
| REVENUES (dollars) | | | | |
| Residential | $201,790,000 | $30,643,000[c] | $71,562,000 | $127,515,000 |
| Total Commercial & Industrial | 295,895,000 | 54,988,000 | 122,382,000 | 279,297,000 |
| Commercial | 138,370,000 | 17,202,000 | 45,384,000 | |
| Industrial | 157,525,000 | 37,786,000 | 76,998,000 | |
| Other | 58,581,000[e] | 2,955,000 | 25,185,000 | 11,456,000[f] |
| TOTAL REVENUES | $556,266,000 | $88,586,000 | $219,129,000 | $418,268,000[g] |
| GENERATION (MWh) | | | | |
| Generated | 18,001,634[h] | 2,779,300 | 5,421,000 | 12,467,000 |
| Total purchased & interchanged | 2,199,602[h] | 474,600 | 2,393,000[i] | 762,000 |
| Purchased | 1,939,912[h] | | | |
| Interchanged | 259,690[h] | | | |
| TOTAL GENERATION | 20,201,236[h] | 3,253,900 | 7,814,000 | 12,516,000[j] |
| ADDITIONAL RATIOS | | | | |
| FUEL COST -- % OF REVENUES | | | | |
| 1971 | 18.4 | - | 20.7 | 21.09 |
| 1972 | 21.6 | | 20.0 | 21.77 |
| 1973 | 23.4 | | 21.5 | 23.20 |
| 1974 | 37.9 | | 27.5 | 33.35 |
| 1975 | 34.4 | | 26.8 | 32.51 |
| 1976 | 32.9 | | 27.4 | 32.85 |
| LABOR COST -- % OF REVENUES | | | | |
| 1971 | 15.5 | | 17.2 | 13.64 |
| 1972 | 15.4 | | 16.0 | 12.89 |
| 1973 | 15.9 | | 14.7 | 10.92 |
| 1974 | 13.5 | | 14.5 | 9.08 |
| 1975 | 12.5 | | 11.6 | 8.21 |
| 1976 | 12.5 | | 10.8 | 8.82 |
| HEAT RATE (Btu/Kwh) | | | | |
| 1971 | 10,246 | | 10,037 | 11,204 |
| 1972 | 10,163 | | 10,030 | 10,647 |
| 1973 | 10,212 | | 9,880 | 10,333 |
| 1974 | 10,431 | | 10,065 | 10,412 |
| 1975 | 10,693 | | 9,982 | 10,224 |
| 1976 | 10,546 | | 9,963 | 10,628 |
| FUEL (average cost/ton) | | | | |
| 1971 | $7.36 | | $10.12 | $7.63 |
| 1972 | 8.23 | | 10.60 | 8.28 |
| 1973 | 9.18 | | 12.04 | 9.34 |
| 1974 | 19.86 | | 16.66 | 15.31 |
| 1975 | 22.78 | | 22.60 | 22.05 |
| 1976 | 20.65 | | 25.40 | 22.78 |
| FUEL (average cost/$10^6$ Btu) | | | | |
| 1971 | - | - | $0.44 | $0.34 |
| 1972 | | | 0.46 | 0.37 |
| 1973 | | | 0.51 | 0.42 |
| 1974 | | | 0.75 | 0.80 |
| 1975 | | | 1.03 | 1.04 |
| 1976 | | | 1.12 | 1.03 |
| EMPLOYEES/$ 1 MILLION REVENUE | | | | |
| 1971 | 19.00 | | 17.4 | 21.0 |
| 1972 | 17.56 | | 16.1 | 16.0 |
| 1973 | 15.78 | | 15.2 | 14.0 |
| 1974 | 12.37 | | 13.3 | 13.0 |
| 1975 | 10.24 | | 10.1 | 11.0 |
| 1976 | 9.21 | | 8.9 | 10.0 |

## Notes: Table E-8

[a] Data is for Ohio Edison Company; it does not include the Company's wholly owned subsidiary Pennsylvania Power Company. These figures were obtained by subtracting Pennsylvania Power Company data (published in a separate annual report) from the consolidated annual report filed by Ohio Edison Company. Data on Pennsylvania Power Company is detailed separately

[b] Although company distributes both natural gas and electric energy, data refers to electric utility operation.

[c] Includes farm customers

[d] Includes "other"

[e] Includes $34,807,000 from "other electric sales", $19,542,000 from "other electric revenues" and $4,232,000 from "steam heating"

[f] Includes $7,789,000 from street lighting and other sources and $3,667,000 from miscellaneous sources

[g] Does not include $11,310,000 of revenue from steam heating operations

[h] Data taken from Moody's Public Utility Manual, 1976

[i] Includes 1,644,000 Mwh purchased from the CAPCO pool, and 749,000 Mwh of other purchased and interchanged power

[j] Includes (713,000 Mwh) due to losses and company uses

# TABLE E-9: CHARACTERISTICS OF INVESTOR-OWNED UTILITIES

|  | PENNSYLVANIA (Cont.) |  |
|---|---|---|
| UTILITY NAME | PENNSYLVANIA POWER & LIGHT CO. | PHILADELPHIA ELECTRIC CO.[b] |
| UTILITY CODE | PEPL | PHEC |
| OPERATING STATISTICS |  |  |
| CUSTOMERS |  |  |
| Residential | 813,638[a] | 1,137,544 |
| Total Commercial & Industrial | 111,025[a] | 121,169 |
| Commercial |  | 115,422[c] |
| Industrial |  | 5,747[c] |
| Other | 1,392[a] | 2,345 |
| TOTAL CUSTOMERS | 926,075[a] | 1,261,058 |
| SALES (Mwh) |  |  |
| Residential | 7,267,000 | 7,585,000 |
| Total Commercial & Industrial | 12,355,000 | 17,417,000 |
| Commercial | 4,874,000 | 2,755,000[c] |
| Industrial | 7,481,000 | 14,662,000[c] |
| Other | 732,000 | 1,271,000 |
| TOTAL SALES | 20,354,000 | 26,273,000 |
| REVENUES (dollars) |  |  |
| Residential | $257,827,692[a] | $373,200,000 |
| Total Commercial & Industrial | 351,946,692[a] | 592,200,000 |
| Commercial |  | 149,300,000[c] |
| Industrial |  | 442,900,000[c] |
| Other | 21,653,045[a] | 59,400,000 |
| TOTAL REVENUES | $631,427,429[a] | $1,024,800,000 |
| GENERATION (Mwh) |  |  |
| Generated | 28,751,000[d] | 20,771,000[e] |
| Total purchased & interchanged |  | 7,666,000 |
| Purchased | 2,126,000 |  |
| Interchanged | (8,358,000) |  |
| TOTAL GENERATION | 20,354,000[f] | 28,437,000 |
| ADDITIONAL RATIOS |  |  |
| FUEL COST -- % OF REVENUES |  |  |
| 1971 | - | 31.2 |
| 1972 |  | 30.9 |
| 1973 |  | 34.0 |
| 1974 |  | 43.4 |
| 1975 |  | 40.3 |
| 1976 |  | 39.3 |
| LABOR COST --% OF REVENUES |  |  |
| 1971 | - | 17.9 |
| 1972 |  | 17.6 |
| 1973 |  | 16.4 |
| 1974 |  | 13.2 |
| 1975 |  | 13.4 |
| 1976 |  | 13.2 |
| HEAT RATE (Btu/Kwh) |  |  |
| 1971 |  | 9,314 |
| 1972 |  | 9,254 |
| 1973 |  | 9,575 |
| 1974 |  | 9,555 |
| 1975 |  | 9,627 |
| 1976 |  | 9,639 |
| FUEL (average cost/ton) |  |  |
| 1971 | - | $10.06 |
| 1972 |  | 11.68 |
| 1973 |  | 13.04 |
| 1974 |  | 19.96 |
| 1975 |  | 25.81 |
| 1976 |  | 25.81 |
| FUEL ( average cost/$10^6$ Btu) |  |  |
| 1971 | - | $0.59 |
| 1972 |  | 0.62 |
| 1973 |  | 0.71 |
| 1974 |  | 1.42 |
| 1975 |  | 1.22 |
| 1976 |  | 1.24 |
| EMPLOYEES/$ 1 MILLION REVENUE |  |  |
| 1971 | - | 17.1 |
| 1972 |  | 15.6 |
| 1973 |  | 13.4 |
| 1974 |  | 10.0 |
| 1975 |  | 8.6 |
| 1976 |  | 7.7 |

## Notes: Table E-9

[a] Data taken from Moody's Public Utility Manual, 1976

[b] Includes data on Philadelphia Electric Company's subsidiaries: Philadelphia Electric Power Co., the Susquehanna Electric Co., and Conwingo Power Co.

[c] Figures shown as "Commercial" use corresponds to "small commercial and industrial: in Company's annual report; "industrial" use corresponds to "large commercial and industrial"

[d] Includes 1,947,000 Mwh from Oil-fired stations, 40,000 Mwh from combustion turbines and diesels, and 809,000 Mwh from hydroelectric stations

[e] Includes 13,385,000 Mwh of steam generation, 4,937,000 Mwh from nuclear power; 2,065,000 Mwh from hydraulic turbines; 1,062,000 Mwh from pumped storage output; (1,506,000 Mwh) from pumped storage input; 792,000 Mwh from internal combustion; and 36,000 Mwh from other sources

[f] Includes (1,961,000) loss due to company uses and transmission losses